

MONTHLY WEATHER REVIEW.

(GENERAL WEATHER SERVICE OF THE UNITED STATES.)

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WAR DEPARTMENT,
OFFICE OF THE CHIEF SIGNAL OFFICER,
DIVISION OF TELEGRAMS AND REPORTS FOR THE BENEFIT OF COMMERCE AND AGRICULTURE.

INTRODUCTION.

In preparing this REVIEW the following data, received up to March 20th, have been used, viz: the regular tri-daily weather charts, containing the data of simultaneous observations taken at 135 Signal Service stations and 13 Canadian stations, as telegraphed to this office; 192 monthly journals and 165 monthly means from the former, and 13 monthly means from the latter; 234 monthly registers from Voluntary Observers; 57 monthly registers from United States Army Post Surgeons; Marine Records; International Simultaneous Observations; Marine Reports through the co-operation of the New York Herald Weather Service; abstracts of Ships' Logs, furnished by the publishers of the New York Maritime Register; monthly reports from the local Weather Services of Iowa, Nebraska and Missouri, and of the Central Pacific Railway Company; reliable newspaper extracts; special reports.

BAROMETRIC PRESSURE.

To illustrate the subject of the distribution of mean atmospheric pressure over the United States and Canada for the month of February, 1882, chart No. II has been prepared, upon which are traced the lines of equal barometric mean values. The areas of lowest mean pressure 30.00, occupy the northern portion of the Upper Lake Region and the eastern half of the Canadian Maritime Provinces. The isobar of 30.05 runs southeastward from northern Dakota to southern Iowa and thence northeastward to the Province of Ontario; with a break in the line at Rockliffe, the isobar commences again near the mouth of the St. Lawrence and runs southward off the coast of Maine. Areas of 30.05 are also found in the lower portion of the Rio Grande Valley and in the North Pacific Coast Region. Throughout the remainder of the country the pressure ranges from 30.07 to 30.24. Compared with the previous month the position of the areas of lowest mean pressure remain unchanged, but the barometer has fallen about 0.05 inch in the Lake Superior region and risen about the same degree in the Maritime Provinces, accompanying a deficiency in the former and an excess in the latter region.

Departures from the Normal Values for the Month.—Compared with the means of previous years, the mean pressure for February, 1882, presents rather unusual features in the disposition and extent of areas of excess and deficiency. The central portion of the country, between the Ohio and Mississippi rivers on the east and the Rocky Mountains on the west, is occupied by a decided area of deficiency, the departures ranging from 0.01 to 0.14 inch, increasing with the latitude. From the western border of this area to the Atlantic Coast, departures of excess prevail, ranging from 0.01 to 0.13

inch. Only four stations, Eastport, Erie, Columbus, and Nashville, report the former departure, the range in general being from 0.04 to 0.09 inch; exceptional departures occur as follows: Mt. Washington, 0.13 inch; Morgantown, 0.12 inch. From the eastern border of the area of deficiency to the Pacific coast, the departures of excess range in the extremes from 0.01 to 0.09 inch, but generally from 0.04 to 0.08 inch. The following stations report a normal condition; Indianola, Galveston and Port Huron.

Barometric Ranges.—The range of pressure for the present month has generally varied from 0.8 to 1.3 inches, and in the extremes from 0.42 inch at Key West to 1.58 inches at St. Vincent, Minn., and Provincetown, Mass. The ranges increase with the latitude throughout the entire country and along the southern boundary of the United States from California and Florida inward to the maximum in Texas. Throughout the various districts the monthly barometric ranges varied as follows: New England, 1.12 inches on summit of Mt. Washington to 1.49 inches at Thatcher's Island and Eastport, and 1.58 inches at Provincetown; Middle Atlantic States, 1.15 inches at Lynchburg to 1.28 inches at Williamsport and 1.47 inches at Atlantic City; South Atlantic States, 0.84 inch at Jacksonville to 1.08 inches at Atlanta and Augusta and 1.42 inches at Hatteras and Kittyhawk; Florida Peninsula, 0.42 inch at Key West to 0.52 inch at Punta Rassa and 0.73 inch at Cedar Keys; Eastern Gulf States, 0.8 inch at Pensacola to 0.92 inch at Vicksburg and 0.93 inch at Montgomery; Western Gulf States, 0.6 inch at Mason to 0.78 inch at Shreveport, 0.97 inch at Little Rock and 0.98 inch at Fort Gibson; Rio Grande Valley, 0.62 inch at Uvalde to 0.72 inch at Rio Grande and 0.74 inch at Castroville; Ohio Valley and Tennessee, 0.95 inch at Nashville to 1.09 inches at Louisville, 1.17 inches at Pittsburg and 1.26 inches at Champaign; Lower Lake Region, 1.23 inches at Toledo to 1.33 inches at Buffalo and Detroit and 1.43 inches at Port Huron; Upper Lake Region, 1.18 inches at Chicago to 1.36 inches at Duluth, 1.37 inches at Marquette and Grand Haven and 1.56 inches at Alpena; Upper Mississippi Valley, 0.89 inch at Des Moines to 1.16 inches at St. Louis and 1.27 inches at Madison; Missouri Valley, 0.9 inch at Leavenworth to 0.92 inch at Omaha and Springfield and 1.12 inches at Huron; Extreme Northwest, 1.24 inches at Moorhead to 1.32 inches at Fort Stevenson and 1.58 inches at St. Vincent; Northern Slope, 0.54 inch at Cheyenne to 0.77 inch at Helena, 1.03 inches at Fort Keogh and 1.16 inches at Fort Assinaboine; Middle Slope, 0.55 inch at Denver to 0.7 inch at Fort Elliott and 0.81 inch at Dodge City; Southern Slope, 0.46 inch at El Paso to 0.66 inch at Coleman and 0.89 inch at Henrietta; Northern Plateau, 0.87 inch at Fort Missoula to 1.01 inches at Lewiston and Dayton and 1.10 inches at Umatilla; Middle Plateau, 0.83 inch at Pioche to 0.89 inch at Winnemucca and 0.9 inch at Salt Lake City; Southern Plateau, 0.42 inch at Fort Grant to 0.48 inch at

Santa Fe and Camp Thomas and 0.57 inch at Prescott; North Pacific Coast, 1.03 inches at Portland to 1.35 inches at Olympia; Middle Pacific Coast, 0.72 inch at San Francisco to 0.76 inch at Sacramento and 0.83 inch at Red Bluff; South Pacific Coast, 0.43 inch at Campo to 0.57 inch at Yuma and 0.61 inch at Visalia.

Areas of High Barometer.—Eight such areas were of sufficient importance to merit description.

No. I.—Was central in Missouri at midnight of the 2d; it then moved over the Lower Lake Region and thence down the St. Lawrence Valley. The temperature fell from 10° to 14° in the northern portion of the Upper Lake Region on the 2d, and following the rise in barometer a fall in temperature of from 20° to 30° was experienced in the Lower Lake Region, St. Lawrence Valley and New England.

No. II.—Highest in Wyoming on the 3d; in New Mexico on the morning of the 4th, and in Texas on the afternoon and night of Sunday; remained highest in the Gulf States during the 5th. The area of highest pressure moved into the South Atlantic States on the 6th; remained high there during the 7th, and extended into the Middle Atlantic States on the 8th, and into New England on the 9th. Midnight map of the 4th showed higher temperature in all districts west of the Mississippi; midnight of the 5th, temperature generally higher in all districts. In the Mississippi Valley and districts to east of it still higher at midnight of 6th, and continued to rise in New England, the Middle, South Atlantic and Gulf States on the 7th. The extreme southern course of this area of high barometer produced a preponderance of southerly winds and a general increase of temperature during its progress.

No. III.—Entered the United States in Washington Territory on the 6th, and on the 7th reached the Missouri Valley, highest pressure, 30.40 inches at Yankton. This area of increased pressure then passed northeastward to Nova Scotia, accompanied by a fall in temperature of from 10 to 30 degrees. The cold wave reached the Missouri Valley on the 6th; on the 7th extended over the Upper Lake Region and the Mississippi Valley, and passed over the Lower Lake Region and the Middle Atlantic States on the 8th.

No. IV.—An area of increased pressure entered Texas on the 8th. Barometer highest in this State on the 9th; at Pittsburgh midnight of the 10th; on the Middle Atlantic coast on the 11th and remained highest in the Middle and South Atlantic States during the 13th. The temperature fell from 10° to 16° in Texas on the 8th; generally in the Middle and South Atlantic States on the 9th, and in New England, the Middle and South Atlantic States on the 10th.

No. V.—The barometer rose 0.15 inch on the California coast during the night of the 10th. This area of increased pressure passed northeastward reaching Nova Scotia on the 14th. The pressure was highest in Colorado on the 13th; at Cairo on the morning of the 14th; extended to the South Atlantic States during the day, and there remained highest during the 15th. The following are the changes in temperature during the passage of this area: 11th, decided fall in California, Nevada and Utah. Cold wave reached the Mississippi Valley on the 12th; extended over Lower Lake Region, Ohio Valley and Tennessee on the 13th, and to New England and the Middle Atlantic States on the 14th.

No. VI.—Increase of pressure first felt in Montana on the 15th; passed to the east and reached the Atlantic coast on the 18th. At midnight of the 15th the temperature had fallen in the Extreme Northwest and Montana from 10° to 40° in last 24 hours. This cold wave covered the Upper Mississippi and Missouri Valleys and the Lake Region on the 16th, and had reached New England and the Middle and South Atlantic States on the 17th, where the fall continued during the 18th.

No. VII.—Passed from the Pacific coast and was central near Yankton on the morning of the 19th; barometer at this station 30.56. Morning of the 20th highest in Manitoba. The area of increased pressure passed thence eastward to the Atlantic coast. At midnight of the 18th the temperature

had fallen from 10° to 20° in the Missouri Valley, and during the next day the cold wave extended over the Mississippi Valley, Kansas and Indian Territory. Afternoon of the 19th the temperature at Fort Gibson 10°, a fall of 55° in 24 hours. 20th, fall of from 10° to 35° in Texas, and 6° to 17° in the Lake Region.

No. VIII.—This area moved from the coast of California to Texas, where it was central on the morning of the 21st. Morning of 22d highest in Arkansas and Missouri. 23d, extended from St. Paul to Leavenworth. 24th, an area of 30.50 inches covered the Lake Region, Tennessee and the Ohio Valley. 25th, highest at Pittsburgh. 26th, highest over Virginia, North and South Carolina; pressure decreased during the day. Morning of the 27th, highest barometer 30.30 at Baltimore. Morning of the 28th, an area of 30.40 extended over New England and the Canadian Maritime Provinces. The following changes in temperature were noted during the passage of this area: morning of the 21st, fall of 13° to 30° in Texas; 10° to 20° in the East Gulf States and Tennessee and in the Mississippi and Missouri Valleys. Morning of the 22d cold wave covered all stations east of the Mississippi; Pittsburgh, 25°, a fall of 32°; Charlotte, N. C., 37°, a fall of 25°. In the South Atlantic States the temperature continued to fall during the 23d and 24th.

Areas of Low Barometer.—Eleven areas of barometric minima appeared within the limits of the Signal Service weather maps during the month of February, 1882, all of which merit description.

No. I.—Passed from Lake Superior to the St. Lawrence Valley on the 1st, causing high SW. winds in the Lower Lake Region.

No. II.—Followed immediately after No. I; was central north of Lake Superior on the morning of the 2d and passed to the eastward accompanied by very little precipitation. South-west winds prevailed during the day in New England, the Middle Atlantic States and Lower Lake Region and had generally veered to NW. by morning of the 3d. Velocities of 28 to 34 miles were recorded in the Lower Lake Region and from 26 to 35 on the New England coast. The following reports furnished through the co-operation of the New York Herald Weather Service, probably indicates the presence of this storm during its passage eastward over the ocean: S. S. *Vaderland*, 5th, in 47° 47' N., 38° 02' W., 29.33, a fall of 0.67 inch, W. to NE., heavy gale with high sea and rain; 6th, in 47° 10' N., 42° 05' W., 29.08, W. to WSW., strong gales, heavy sea, thunder and lightning; 7th, in 46° 21' N., 44° 38' W., 29.27, WSW. to WNW., heavy gale with tremendous sea. S. S. *Arizona*, 4th, in 43° 58' N., 54° 20' W., variable to NW., strong breeze, overcast and high head sea; 5th, in 42° 10' N., 62° 24' W., NW. to SW., strong gale increasing to hurricane, dangerous sea; 6th, in 41° 22' N., 63° 25' W., W., strong gale with high head sea. S. S. *City of Brussels*, 4th, in 42° 44' N., 53° 54' W., SSW. to NW., strong breeze to fresh gale; 5th, in 41° 59' N., 60° 22' W., fresh to strong gale, heavy snow; 6th, in 41° 33' N., 61° 40' W., SSE. to SW. and W., hurricane for 12 hours, followed by heavy gale from W.; 7th, in 41° 02' N., 66° 18' W., NW., strong breeze, very heavy squalls, high sea, followed on the 8th by fine weather. S. S. *W. A. Scholten*, 4th, in 43° 32' N., 53° 14' W., 29.38, a fall of 0.74 inch in past 24 hours, NW., force 8, high sea; 5th, in 42° 37' N., 57° 24' W., 29.71, ESE., force 4, very high sea; 6th, in 41° 57' N., 58° 47' W., 29.42, NW., force 10, very high sea, stormy; 7th, in 41° 09' N., 61° W., 30.20, NW., force 8, very high sea, stormy. S. S. *P. Caland*, 9th, in 49° 44' N., 22° 38' W., 29.00, a fall of 0.94 inch, WSW., force 6. Ocean data from other sources as follows: S. S. *Athos*, 3d, 11 p. m., in 37° N., 74° W., violent storm from NE., barometer 30.40; wind gradually increased and hauled to E. with rapidly falling barometer accompanied by torrents of rain. 4th, barometer 29.65, wind shifted to SE. blowing a heavy gale with high sea and much rain; noon, wind suddenly shifted to WSW. with increased violence, hard squalls and rain; 2 p. m., wind backed to S. and at 8 p. m. shifted to W. still very violent with heavy rain and terrific sea; 6 p. m., gale increased to

hurricane and settled down from W. with clearing weather, barometer 29.18. 5th, 3 a. m., in 34° N., 74° W., gale continued as hard as ever with tremendous high sea, barometer rising gently and at midnight reached 30.30 with fine clear weather. S. S. *Belgenland*, 4th, in 40° 23' N., 73° 13' W., violent gale accompanied with heavy snow and rapidly falling barometer, wind started at NE. shifting to N. and NW., blowing with great violence, barometer 28.70 at 3 p. m. At 10 p. m. perfectly calm when suddenly without any warning gale sprang up from the SW. and blew violently for about 2 hours when it again shifted to NW. and blew a heavy gale, sea very high, barometer steadily rising. S. S. *Muriel*, 4th, off Highlands, New Jersey coast, heavy E. wind with threatening weather and snow; gale steadily increased and during the night became a most violent storm, accompanied with heavy snow. Barometer fell steadily and on morning of the 5th, reached 29.05 when wind suddenly shifted to NW. and WNW. followed by clearing weather.

Nos. III and IV.—The morning map of the 3d showed No. III central in Manitoba and No. IV near Galveston. The northern storm produced but slight changes and lost its identity on the afternoon of the 4th; at this time No. IV was central near Norfolk, Va. Barometer at that station 29.31 inches, a fall of 0.81 inch in last 24 hours. The following are the weather conditions noted during the passage of this storm: In the West Gulf States, heavy rains on the 2d and 3d, generally clear at midnight of 3d, with wind NW.; East Gulf States, heavy rains 3d and 4th, clear, with NW. winds at midnight of 4th; South Atlantic States, rain on 4th; Middle Atlantic States, NE. winds and heavy snow on 4th, clearing and winds westerly on 5th; New England, snow on 4th and 5th. The following velocities were recorded: Galveston, NW. 40; Indianola, NW. 51; Pensacola, SW., 36; Cedar Keys, W. 38; from 30 to 42 on the South Atlantic coast; 60 miles at Cape Hatteras and Cape May; 64 miles at New Shoreham and 28 to 40 miles on the New England coast. The following ship's report probably indicates the presence of this storm during its passage eastward over the ocean: S. S. *Iberian*, 6th, in 47° 30' N., 43° 38' W., 29.15, wind unsteady from SW. to SE. Barometer continued falling and on the 8th, in 50° 38' N., 30° 20' W., wind hauled to E., with heavy rain; 8 p. m., wind backed to SW. with increasing force, and on the following morning blew a hurricane for about 3 hours, when it moderated with fine clear weather by noon.

No. V.—Was central on the morning of the 6th near Fargo. Weather generally fair in all districts. On the 7th it rained in the Lower Lake Region, Tennessee and the Ohio Valley, and snowed in the northern portion of New England. In the Middle Atlantic States, rain fell during night of the 7th. Velocities of 28 to 32 miles were recorded in the Lake Region and from 25 to 31 miles on the New England coast. The following reports furnished through the co-operation of the New York Herald Weather Service probably indicates the presence of this storm during its passage eastward over the ocean: S. S. *Vaderland*, 8th, in 45° 39' N., 47° 19' W., 29.74, WNW., heavy gale with very high sea, vessel slowed, shipping heavy water; 9th, in 45° N., 51° 05' W., 29.51, SSE. to NW., moderate gale, changing suddenly to complete cyclone with terrible sea, vessel severely damaged; 10th, in 44° 07' N., 54° 53' W., 29.47, NW. to SE., heavy gale, terrible sea; 11th, in 42° 51' N., 57° 32' W., 29.32, SE. to NNE., terrific gale ending in a complete revolving storm, violent sea; 12th, in 42° 30' N., 59° 24' W., 30.50, NNE. to N., terrible gale with tremendous sea; 13th, in 41° 34' N., 64° 10' W., 30.32, N. to WSW., wind and weather moderate, sea smooth. S. S. *City of New York*, 9th, in 44° 22' N., 44° 45' W., N. to S., strong breeze to strong gale, high head sea; 10th, in 43° 41' N., 47° 29' W., S. to NW., strong gale to light breeze, very high head sea. S. S. *Celtic*, 8th, in 43° 24' N., 53° 18' W., WNW., strong gale, heavy head sea; 9th, in 42° 16' N., 58° 22' W., NNW., strong gale, high head sea; 10th, in 41° 10' N., 65° 13' W., SW., strong breeze with rain. S. S. *Catalonia*, 8th, in 45° 42' N.,

53° 29' W., WNW. and NW., strong gale; 9th, in 45° 27' N., 57° 45' W., NW., heavy gale, high sea. S. S. *P. Caland*, 12th, in 48° 49' N., 34° 37' W., 29.24, a fall of 0.56 inch, WSW., force 9, heavy squalls with rain.

No. VI.—This area appeared central near Brownsville, Texas, at midnight of the 7th. It rained during the night in the Gulf States. General and heavy rains occurred in the South Atlantic States, Tennessee and the Ohio Valley on the 8th, and in the Middle Atlantic and New England States on the 9th. Velocities noted: 26 to 32 miles at Gulf stations; 34 to 48 miles on South Atlantic coast and 28 to 46 miles on the Middle Atlantic and New England coasts. The following reports furnished through the co-operation of the New York Herald Weather Service probably indicates the presence of this storm during its passage eastward over the ocean: S. S. *Abyssinia*, 10th, in 47° 29' N., 40° 06' W., WNW., heavy gale, snow and hail showers, high sea; 11th, in 45° 59' N., 45° 40' W., westerly, fresh to moderate gale, squalls and showers of rain and hail; 12th, in 44° 46' N., 48° 50' W., W. to NNW., strong gale, very high confused sea, cold, frosty weather. S. S. *Gallia*, 11th, in 43° 46' N., 48° 53' W., S. to W., fresh gale to moderate breeze and head sea; 12th, in 42° 54' N., 52° 45' W., W. to NW., strong gale and high confused sea; 13th, in 41° 55' N., 59° 20' W., N. to NW., fresh breeze and head sea. S. S. *City of New York*, 11th, in 42° 38' N., 52° 25' W., S. to W., light breeze to strong gale, very high head sea; 12th, in 42° 16' N., 56° W., W. by S. to NW., strong gale and high confused sea; S. S. *Catalonia*, 10th, in 44° 33' N., 62° 45' W., wind shifted from NW., to WSW. and E., strong gale, heavy snow, stopped engines, ship drifting. S. S. *Republic*, 10th, in 40° 37' N., 68° 16' W., 29.26, W. by S., force 2, drizzling rain; 11th, in 41° 13' N., 61° 01' W., 29.82, NW., force 7, overcast, snow and hail; 12th, in 41° 42' N., 53° 14' W., 30.31, NNW., force 6, cloudy, snow and hail.

No. VII.—Was central near Bismarck on the afternoon of the 10th, having moved from Washington Territory in past 24 hours. Rain fell in the Upper Mississippi Valley on the 11th, and in Texas during the night of the same day. General rains occurred in the Lower Lake Region, Tennessee and the Ohio Valley and the East Gulf States on the 12th and 13th. In the New England and Middle Atlantic States on the 13th and in the South Atlantic and East Gulf States on the 14th. The following reports furnished through the co-operation of the New York Herald Weather Service probably indicates the presence of this storm during its passage eastward over the ocean: S. S. *Abyssinia*, 14th, in 42° 42' N., 60° 13' W., WSW., fresh gale, heavy rain and high head sea; 15th, in 41° 06' N., 65° 53' W., westerly, moderate to light winds, fine weather and moderate sea. S. S. *Zeeland*, 14th, in 47° 33' N., 39° 13' W., 30.02, a rise of 0.28 inch in past 24 hours, WNW. to NW., strong breeze with heavy squalls, high head sea, clear; 15th, in 46° 51' N., 43° 17' W., 29.90, W. to WSW. and NW., strong fresh breeze, sea moderating, by noon light rain; 16th, in 46° N., 49° 11' W., 29.88, N. and NE., moderate to fresh breeze, light snow squalls at intervals. Ocean data from other sources as follows: S. S. *Mississippi*, 9th, in 48° 17' N., 123° 55' W., near entrance to Straits of Juan de Fuca, took heavy gale commencing at NE. with heavy snow. Wind backed gradually around to WNW., when it moderated and cleared. Shortly after, barometer fell rapidly to 28.90, remaining steady until about noon, when it commenced rising and at 3 p. m. stood at 29.65, where it remained steady for 24 hours. Sea from SSE., high and confused; wind throughout the storm between WNW. and NE. Course, a little north of west out of the straits; when south of entrance about 20 miles gale moderated. Barometer continued falling until course was changed to S., when it remained stationary for about 3 hours, rising thereafter as suddenly as it fell.

No. VIII.—Central in southern Wisconsin at midnight of the 15th; moved northeast to the St. Lawrence Valley, and thence southeast, passing off the coast of Maine. During the night of the 16th, rain fell in the Middle Atlantic States and

the Lower Lake Region, and snow in New England on the 16th and during the night of the same day. High winds occurred on the North Atlantic coast after the passage of the centre. The following reports furnished through the co-operation of the New York Herald Weather Service probably indicates the presence of this storm during its passage eastward over the ocean: *S. S. Waesland*, 18th, in 46° 46' N., 38° 52' W., 29.62, a fall of 0.36 inch in past 24 hours, NE. to SE., partly cloudy, with rain during latter part of day; 19th, in 45° 05' N., 45° 42' W., 29.42, SSW., overcast and smooth sea; 20th, in 43° 29' N., 50° 40' W., 29.91, NNW., strong, overcast with snow squalls: *S. S. City of Montreal*, 17th, in 42° 26' N., 60° 18' W., W. to SSW., light breeze, clear; 18th, in 41° 06' N., 65° 35' W., SW. to NW. and N., fresh wind to fresh gale, heavy rain changing to snow, heavy beam sea. *S. S. Britannic*, 16th, in 44° 31' N., 47° 50' W., W. and N., fresh breeze and overcast; 17th, in 42° 53' N., 56° 26' W., variable, light breeze and fine; 18th, in 41° 43' N., 63° 34' W., 29.89, a fall of 0.91 inch in past 24 hours, S. and N., hard gale and high sea. *S. S. Servia*, 18th, in 42° 50' N., 55° 36' W., southerly, moderate breeze; 19th, in 41° 23' N., 62° 08' W., northerly, strong gale and heavy squalls. *S. S. Zealand*, 17th, in 44° 38' N., 54° 01' W., 29.80, NW. to W. and SW., light breeze and dense fog throughout the whole 24 hours; 18th, in 43° 36' N., 57° 30' W., 29.74, SW. to W. and NNW., fierce gale, tremendous sea, occasional snow squalls; 19th, in 42° 26' N., 59° 28' W., 29.88, northerly gale, weather and sea moderating. *S. S. Celtic*, 17th, in 40° 41' N., 69° 46' W., 29.57, SW., force 4, foggy; 18th, in 41° 04' N., 62° 40' W., 29.95, NW., force 6, cloudy; 19th, in 41° 51' N., 55° 29' W., 29.75, NW., force 6, cloudy.

No. IX.—Was central in Colorado on the morning of the 18th. Rain fell during the day in the Upper Mississippi Valley and Upper Lake Region. The rain area moved eastward into New England and the Lower Lake Region during the 19th, and on the same day heavy and general rains occurred in the Ohio Valley and Tennessee. The following reports furnished by the co-operation of the New York Herald Weather Service probably indicates the presence of this storm during its passage eastward over the ocean: *S. S. Waesland*, 21st, in 42° 19' N., 57° 19' W., 29.93, strong easterly winds, overcast with snow squalls: *S. S. Zealand*, 20th, in 41° 20' N., 64° 07' W., 29.64, a fall of 0.24 inch in past 24 hours, N. to SW., calm, cloudy; 21st, in 40° 47' N., 69° 11' W., 29.70, N. to ENE. and ESE., light to fresh breeze with occasional rain. *S. S. Wisconsin*, 19th, in 43° 39' N., 53° 54' W., N. to W., heavy gale and snow; 20th, in 42° 23' N., 59° 54' W., N. to E., moderate gale, snow and heavy head sea; 21st, in 40° 48' N., 66° 18' W., N. to SE., gales and snow. *S. S. Assyrian Monarch*, 19th, in 41° 50' N., 63° 45' W., N., heavy gale and high sea.

No. X.—Central in Texas at midnight of the 19th, with heavy rains in West Gulf States. The rain of the 19th, in Tennessee and the Ohio Valley, continued during the 20th. This day rain fell in Lower Lake Region and Middle Atlantic States, and snow in the Upper Lake Region. On the 21st it rained in Tennessee and the Middle Atlantic States, and snow fell in the Ohio Valley, the Lower Lake Region and in New England. Snow continued in the Lake Region and New England on the 22d and 23d, the weather generally clearing in the other districts.

The following reports furnished through the co-operation of the New York Herald Weather Service probably indicates the presence of this storm during its passage eastward over the ocean: *S. S. Waesland*, 22d, in 41° 35' N., 63° 46' W., 29.14, a fall of 0.79 inch in past 24 hours, ESE., partly cloudy changing to stormy weather; 23d, in 40° 44' N., 64° 54' W., 29.48, W., heavy gale with high head sea, ship laboring heavily; 24th, in 40° 17' N., 71° 01' W., 29.96, N., moderating, snow squalls. *S. S. Adriatic*, 22d, in 45° 38' N., 44° 48' W., NE., strong breeze and beam sea; 23d, in 42° 58' N., 50° 20' W., variable, light winds and cloudy; 24th, in 42° N., 55° 10' W., variable, moderate gale and snow squalls; 25th, in 41° 03' N., 60° 57' W., N. to NNE., moderate gale and snow squalls. *S. S. The Queen*, 22d, in 40° 28' N., 69° 42' W., SE. to WNW., heavy head sea and rain. *S. S. Parthia*, 24th, in 46° 13' N., 42° 58'

W., SSW, to WSW. and SE., moderate breeze, cloudy with rain and confused sea. *S. S. Zealand*, 22d, in 40° 29' N., 73° W., 29.58, a fall of 0.12 inch in past 24 hours, SE. to W. and WNW., strong breeze, rainy and misty. *S. S. Baltic*, 21st, in 43° 03' N., 51° 15' W., W. and NE., variable, cloudy, confused sea; 22d, in 42° 16' N., 58° 55' W., variable, strong winds, squally, rough sea; 23d, in 41° 39' N., 62° 57' W., NW. and N., strong gale, heavy head sea.

No. XI.—Moved down the Missouri Valley on the 27th; on the morning of the 28th it was central near Little Rock, and thence moved NE. to the Lake Region. Heavy and general rains occurred during the passage of this storm in the Mississippi Valley, Tennessee and the Ohio Valley, the East Gulf States, the Lake Region, the Middle Atlantic and New England States.

INTERNATIONAL METEOROLOGY.

International charts Nos. IV and V accompany the present REVIEW for February, 1882. The former is published for December, 1879, and continues the series of that chart, commenced in January, 1877. The "Beobachtungen auf dem Nordatlantischen Ocean" for December, 1879, kindly furnished this office through the courtesy of Prof. Dr. G. Newmayer, Director of the German Marine Observatory, has been used in the preparation of the present chart. Chart No. V is prepared for the month of March, 1880, and continues the series of this chart, commenced in November, 1877.

Chart No. IV shows the mean pressure, temperature and the prevailing direction of the wind at 7.35 a. m. Washington, or 0.43 p. m. Greenwich mean time, for the month of December, 1879, over the Northern, and at certain isolated stations in the Southern, Hemisphere. The pressure is generally high, even over British India, where the mean at no station falls below 29.92. There are two areas of comparative barometric minima, one embracing Iceland and Greenland and the other occupying northeastern Russia and northwestern Siberia. The most decided of the above indicated depressions is the former, lowest mean reading 29.47, at Stykkisholm. This area of barometric minima probably resulted from the translation northward of one of the November depressions (29.90) central over the Azores and Madeira Islands, and its combination with a slight depression (29.80) central that month over Greenland. There are five principal areas of high pressure for the month, distributed as follows: In central Mexico, 30.30; in Manitoba, 30.20; in 35° N., 70° W., 30.20; in western Europe, 30.40; in southeastern Siberia, 30.40. The extreme mean pressures for the month are, 29.47 (lowest) at Stykkisholm and 30.49 (highest) at Nertschinsk. The extreme monthly range of mean pressure for the month is 1.02 inches, which is 0.52 inch smaller than the range for December 1877, and 0.18 inch smaller than the range for the same month in 1878. The following extreme monthly mean temperatures are given in Fahrenheit's scale: *Lowest*: York Factory, -31°; Fort Garry, -18°; Moose Factory, -16°; Nertschinsk, -12°; Fort Buford, -8°; Bismarek, -5°; Nikolaievsk, -3°; Yeniseisk, 1°; Ekaterinburg, 3°; Kasan, 8°; Archangel, 10°; Godthaab, 14°; Szathmar, 16°; Bamberg and Haparanda, 17°; Zurich, 19°. *Highest*: Mauritius, 80°; Paramaribo, 79°; Santiago, Cape Verde Islands and Fort Napier, 78°; Poona and Bridgetown, 77°; Fort de France, Navassa and Bombay, 76°; Kingston, Jamaica, Santiago de Cuba and San Juan de Puerto Rico, 74°; Honolulu, 71°; Tlacotalpam, 70°. The prevailing direction of the winds over the United States was *southwesterly* in the Atlantic coast States, except *westerly* in New England; *southerly* from the Gulf coast northeastward to the Lakes; *northwesterly* in the Lake Region, Upper Mississippi and Lower Missouri Valleys, Rocky Mountain Slopes and in western Texas; *southerly* in the northern Pacific Coast Region and variable in the Middle and Southern Pacific Coast and Plateau Regions. In Canada and the Maritime Provinces, *westerly*. In Central Mexico, *variable*. Over the Atlantic Ocean from the American coast eastward to 40° W.,

northeast, and northwest; from the European coast westward to 40° W., northeast, southeast and southwest. In Europe, southwesterly north of 50° N. and west of 30° E.; south of that parallel and in Russia, northeast to northwest. In Algiers, northerly. In Hindostan, variable. Along the Asiatic coast and over the Japan Islands, northeast to northwest. Compared with December, 1877 and 1878, the temperature over the United States is considerably lower in the Pacific Coast States, the Rocky Mountain Regions, in the Upper Mississippi and Lower Missouri Valleys, in the Upper Lake Region, St. Lawrence Valley and in the Canadian Maritime Provinces, the change ranging from 3° to 20°, being most marked in the vicinity of the Upper Lake Region. The pressure is considerably higher on the Pacific coast south of Oregon, also in the northern sections of the country and in Canada; while in the southeastern portion of the United States, the barometer shows but little change. Over the Atlantic the pressure is considerably higher south of 50° N. and west of 40° W. In the region of the Azores and Maderia Islands there is a fall of about 0.10 inch. The greatest change occurs north of 50° N., where there is a decrease of 0.05 to 0.20 inch. The change in temperature is very small except north of 50° N., where west of 35° W., there is a decided fall, and to the eastward, a considerable rise. In the various countries of Europe and Asia, the following changes occur: British Isles, temperature slightly lower and the pressure from 0.11 to 0.50 inch higher. Denmark, temperature from 3° to 5° lower and pressure from 0.40 to 0.50 inch higher. Norway, temperature normal and the pressure from 0.01 to 0.20 inch higher. Sweden, temperature from 1° to 3° lower and the pressure from 0.07 to 0.27 inch higher. France, temperature from 3° to 10° lower and the pressure from 0.20 to 0.40 inch higher. Germany, temperature from 4° to 16° lower and the pressure from 0.25 to 0.55 inch higher. Austria, temperature from 10° to 17° lower and the pressure from 0.30 to 0.45 inch higher. Algeria, temperature from 0° to 2° lower and the pressure from 0.15 to 0.25 inch higher. Italy, temperature from 2° to 5° lower and the pressure from 0.20 to 0.35 inch higher. Portugal, temperature from 6° to 9° lower and the pressure from 0.09 to 0.12 inch higher. Spain, temperature slightly lower and the pressure from 0.10 to 0.20 inch higher. Turkey, temperature from 1° to 3° higher and pressure from 0.08 to 0.24 inch higher. Russian Empire, temperature from 1° to 3° higher and pressure from 0.05 to 0.50 inch lower. British India, temperature from 1° to 3° lower and the pressure from 0.01 to 0.05 inch lower. The accompanying table shows the deviations in temperature and barometer at isolated stations for the month of December, 1879, as compared with the means of the past two years:

Comparative Thermometric and Barometric Means, with corresponding Departures.

STATION.	Mean Temperature.			Mean Barometer.		
	Dec., 1877-78.	Dec., 1879.	Departure.	Dec., 1877-78.	Dec., 1879.	Departure.
York Factory.....	-4.0	-31.4	-27.4	29.90	30.06	+0.16
Godthaab.....	23.7	14.0	-9.7	29.67	29.48	-0.19
Stykkisholm.....	25.8	33.3	+7.5	29.68	29.47	-0.21
Tromsø.....	29.5	28.5	-1.0	29.59	29.48	-0.11
Thorshavn.....	36.1	41.9	+5.8	29.67	29.80	+0.13
Archangel.....	29.4	10.0	-19.4	30.02	29.58	-0.44
Ekaterinburg.....	10.6	3.2	-7.4	30.53	29.75	-0.78
Barnaul.....	-9.0	10.8	+19.8	30.59	31.06	+0.47
Yeniseisk.....	-13.6	1.2	+14.8	30.62	30.06	-0.56
Nikolai-evsk on the Amoor.....	-10.6	-3.1	+7.5			
Zi-Ka-Wei.....	40.1	39.0	-1.1	30.37	30.24	-0.13
Tokel.....	40.5	44.1	+3.6	29.89	29.90	+0.01
Pekin.....	22.5	28.8	+6.3	30.38	30.26	-0.12
Tashkend.....	22.6	38.8	+16.2	30.58	30.21	-0.37
Nukuss.....	25.6	33.8	+8.2	30.44	30.10	-0.34
Beirut.....	67.3	62.4	-4.9	30.05	30.02	-0.03
Mauritius.....	80.3	80.2	-0.1	29.95	29.91	-0.04
Fort Napier.....	75.1	78.1	+3.0	29.79	29.76	-0.03
Paramaribo.....	81.8	79.0	-2.8	29.98	29.98	Normal
Funchal.....	66.7	65.8	-0.9	30.12	30.10	-0.02
Ponta Delgado.....	63.2	63.1	-0.1	30.69	30.02	-0.67
Angra.....	60.0	57.7	-2.3	30.09	29.94	-0.15
Bridge town.....	80.4	77.1	-3.3	29.94	29.93	+0.01

Comparative Thermometric and Barometric Means, etc.—Continued.

STATION.	Mean temperature.			Mean barometer.		
	Dec., 1877-78.	Dec., 1879.	Departure.	Dec., 1877-78.	Dec., 1879.	Departure.
Navassa.....	78.7	76.1	-2.6	29.98	30.02	+0.04
San Jose de Costa Rica.....	66.7	64.2	-2.5			
Mexico.....	45.0	45.9	Norm'l	30.26	30.26	Normal
Melbourne.....	59.7	59.2	-0.5	29.92	29.87	-0.05
Hobart Town.....	59.2	59.5	+0.3	29.69	29.70	+0.01
San Juan de Puerto Rico.....	77.2	74.1	-3.1	29.99	30.06	+0.07
Nassau.....	71.2	73.0	+1.8	30.10	30.15	+0.05
Havana.....	70.9	72.2	+1.3	30.07	30.09	+0.02
Astrakhan.....	29.7	27.7	-2.0	29.32	29.09	-0.23
Lahore.....	56.9	50.0	-6.9	29.95	30.14	+0.19
Tiflis.....	57.3	58.1	+0.8	30.04	30.04	Normal
Laghouat.....	37.8	43.7	+5.9	30.23	30.15	-0.08
Fort de France.....	58.3	50.9	-7.4	30.07	30.29	+0.22
Lisbon.....	77.8	76.1	-1.7	29.87	29.98	+0.11
Madrid.....	53.4	49.3	-4.1	30.14	30.25	+0.11
Madrid.....	45.6	41.9	-3.7			
Cagliari.....	53.4	51.3	-2.1	29.88	30.12	+0.24
Sandwich Manse.....	37.5	40.5	+3.0	29.66	30.03	+0.37
Malta.....	62.9	57.6	-5.3	29.95	30.11	+0.16

Chart No. V.—This chart displays the tracings of the probable courses of twenty-eight of the principal storm areas of the Northern Hemisphere for the month of March, 1880. The approximate paths of progressive movement are based upon daily simultaneous international observations to the number of over 650, besides a large mass of irregular data which reaches this office in various ways, from the logs of vessels of the Merchant Marine of the North Atlantic and North Pacific oceans. Concerning the general distribution of the paths of the areas of barometric minima, the following is given: Fifteen areas traversed portions of the United States, six of which entered that country from the British Possessions and four from the Pacific ocean. Twelve of these storms reached the Atlantic ocean, five of which passed eastward beyond the 30th meridian west, and one entered southwestern Europe over Spain. Nine areas traversed portions of Northern Europe and northwestern Asia, five of which came from the Atlantic ocean. Four areas passed northeastward in the vicinity of the Japan Islands. Of the storms first appearing in North America, the following brief descriptions are given: No. 1.—This depression appeared off the coast of British Columbia on the 1st, accompanied by rain and southerly winds in the North Pacific Coast Region. During the day the area of barometric minima moved rapidly southeastward and by the following morning was central in northern Montana; Virginia City, 29.15, a fall of 0.23 inch, SW. fair. 3d, depression central in the northern portion of Upper Mississippi Valley, with a barometric trough of 29.60 running southwestward from Lake Superior to western Texas; Omaha, 29.43 a fall of 0.52 inch, S. cloudy; St. Paul, 29.44, a fall of 0.52 inch, SE. threatening. During the day the northeastern portion of the depression moved rapidly eastward, and on the following morning was central in the Lower St. Lawrence Valley, accompanied by southerly winds and light to heavy rain and snow in the Canadian Maritime Provinces. Chatham, N. B., 29.59, a fall of 0.76 inch, S. cloudy; Windsor, N. S., 29.59, a fall of 0.77 inch, SE. raining; Bathurst, N. B., 29.61 a fall of 0.74 inch, S., snowing. 5th, depression central south of Newfoundland, followed by northerly winds and rising barometer in the Maritime Provinces; in 42° N., 60° W., SSW. and NNW., strong, violent rain squalls; in 43° 29' N., 49° 20' W., WNW., fresh gale, high sea. 6th, in 42° 36' N., 55° 04' W., WNW., fresh gales, high sea; in 44° 45' N., 45° 03' W., S. and SW., heavy gale, with rain squalls; in 45° 08' N., 48° 50' W., strong WNW. gale hauling to NNW; in 43° 18' N., 48° 51' W., 29.27, SW., force 7, cloudy. 7th, in 48° N., 47° W., strong NW. gales, encountered several ice bergs, some apparently 120 feet high; in 43° N., 51° W., W. and NW., strong gale, high cross sea; in 45° N., 43° W., WNW., heavy storm, hail and rain squalls; in 48° N., 34° W., WSW., strong gale; in 48° N., 31° W., NW. to SE., fresh gale to calm;

in 42° 51' N., 52° 49' W., 29.83, NW., force 7, high sea and cloudy. 8th, depression central near 50° N., 40° W. In 47° N., 36° W., SSE. to NW., very stormy, with rain and high sea; in 46° 43' N., 39° 30' W., W. hard gale; in 49° 22' N., 26° 01' W., 29.57, SW., force 7, very high sea and cloudy. 9th, in 48° 29' N., 31° 10' W., 29.27, ENE., force 7, high sea and cloudy. 10th, in 49° 52' N., 29.39' W., S and NW., heavy gales, very high sea; in 48° 27' N., 31° 25' W., NW., strong gale, high confused sea; in 46° 19' N., 38° W., 29.70, NNW., force 4, moderate sea, hailing. Owing to lack of reports the further course of this depression could not be indicated upon the chart. In all probability it did not pass eastward to the main-land of northern Europe because of the high pressures prevailing in that region, ranging from 30.30 to 30.70, highest in Norway. Throughout the whole of western Europe the pressure was above 30.20. No. IV.—Rapidly following area No. I this depression appeared off the coast of British Columbia on the 3d, accompanied by southerly winds and rain and snow in the North Pacific Coast Region. Olympia, 29.40, a fall of 0.23 inch, S., light snow. 4th depression central in Lower Missouri Valley. Dodge City, 29.14, a fall of 0.13 inch, S., cloudy; North Platte, 29.23, a fall of 0.06 inch N., cloudy. 5th central in the Lower Lake Region. Buffalo, 29.22, a fall of 0.42 inch, SW., clear. Kingston, Ontario, 29.21, a fall of 0.54 inch, NE., cloudy; Norwood, Ontario, 29.20, a fall of 0.33 inch, NE., gloomy. The following day this depression combined with area No. I., then central over the ocean southeast of Nova Scotia. No. VI.—Probably central in British Columbia on the 4th; this depression passed rapidly southeastward over the Saskatchewan valley and by the morning of the 6th was central in eastern Dakota inclosed by the isobar of 29.80. 7th, depression central north of Lake Superior, with diminished energy, and during the day passed eastward to the Lower St. Lawrence Valley, becoming central on the following morning over the Gulf. During the 8th the depression disappeared to the eastward over Newfoundland, possibly combining with No. I. No. VIII.—This depression first appeared in the Rio Grande Valley on the 6th, and with slight energy but rapid movement the area passed northeastward over the northern portion of the Western Gulf States, through Tennessee and southern Virginia, reaching the Atlantic Ocean during the afternoon of the 7th, disappearing thereafter in a high pressure area 30.30. No. IX.—Probably central in the Saskatchewan valley on the 7th, the depression moved southward to the Middle Plateau where it was central on the 8th. 9th, depression central in southern California, passing thence east-southeast through Arizona and New Mexico to the Rio Grande Valley, where it was central on the 11th. During this day and the following the depression pursued a very irregular course, disappearing on the 13th in a high pressure area over the eastern portion of the Gulf of Mexico. No. X.—This depression appeared in the Rio Grande Valley on the 8th, and during the day passed northeastward over the western portion of the Gulf and thence across the central portion of the Eastern Gulf States, reaching the South Atlantic coast on the 9th. During the day the centre passed eastward off the coast, and by the following morning was central over the ocean in about 40° N., 60° W. In 39° 31' N., 60° 34' W., 29.13, W., force 6, 12 hours heavy rain, heavy SE. to W. sea. 11th, in 48° 32' N., 38° 15' W., 29.72, ESE., force 6, cloudy; in 45° N., 42° 55' W., 29.04, SW., force 9, very heavy sea, cloudy; in 48° N., 35° W., NW. and S., heavy gales; in 47° 17' N., 37° 20' W., variable winds, heavy gales with dangerous sea; in 45° N., 42° 55' W., 29.30, SW., force 11, heavy gale with rain squalls; in 44° N., 25° W., very heavy SE. gales; in 43° 51' N., 47° 29' W., SSE. to NW., heavy gales and dangerous sea; in 42° N., 53° W., SE. to SW. and NW., stormy, high confused sea; in 43° 32' N., 47° 20' W., SE., W. and SW., fresh to whole gale, with squalls of rain; in 46° 30' N., 47° 40' W., passed large icebergs from 40 to 50 feet high. 12th, in 39° 10' N., 31° 55' W., 29.89, WSW., force 7, cloudy; in 36° 10' N., 32° 15' W., 30.02, W., force 5, confused sea; in 50° 39' N., 33° 17' W., 29.35,

SSE., force 2, drizzling rain; in 44° 11' N., 44° 06' W., 29.46, NNW., force 7, very heavy sea; in 43° N., 52° W., WNW., whole gale; in 43° N., 50° W., NW., heavy gale; in 47° N., 40° W., S. and W., fierce gale, tremendous sea with heavy rain squalls; in 46° 32' N., 40° 19' W., W. and NW., heavy gale, dangerous sea; in 50° 39' N., 33° 17' W., 29.20, SE. by S., strong gale, with rain squalls. 13th, a. m., in 47° 25' N., 27° 42' W., SW., strong gale increasing to nearly a hurricane; 3 p. m., terrific squall from the W., the gale from the S. not ceasing until the squall was upon the vessel without any warning whatever; hurricane from the SW. continued for about one hour with a tremendous sea, completely engulfing the ship; 7 p. m., hurricane from SW. slightly diminished in force, which continued to wane until a moderate westerly gale was reached at 4.30 a. m., of 14th. In 52° 17' N., 27° 14' W., 29.21, violent SE. by E., gale; in 45° 30' N., 43° 26' W., NW., strong gales, violent squalls; in 49° N., 41° W., SW., strong gale, high sea, heavy rain squalls; in 45° N., 44° W., NW., fierce gale, tremendous sea with rain squalls; in 44° N., 43° W., NW., very heavy gale; in 41° 47' N., 28° 30' W., 29.53 SW., force 9, hail storm; in 36° 15' N., 35° 45' W., 29.96 WNW., force 7, showery; in 50° 47' N., 21° 15' W., 29.81, WSW., force 5, heavy rain for one hour; in 42° 58' N., 42° 57' W., 29.76, WNW., force 6, cloudy. 14th, in 36° 05' N., 39° 05' W., 30.04, W., force 6, showery; in 43° 24' N., 25° 20' W., 29.83, SW., force 5, cloudy; in 53° 46' N., 20° 38' W., 29.71, ESE., force 5, fair; in 49° 49' N., 26° 55' W., 29.37, WSW., force 6, heavy rain for two hours; in 44° 26' N., 37° 01' W., 29.58, WNW., force 6, cloudy; in 42° 28' N., 49° 31' W., 29.97, NNW., force 7, very heavy westerly sea, cloudy; in 50° N., 25° W., WSW., strong gale, high sea; in 48° 50' N., 25° 45' W., 29.42, WSW., force 6, tremendous sea, violent squalls of hail and snow; in 44° 30' N., 46° 10' W., NW., fierce gale, high sea; in 48° N., 36° W., NW., strong gale and high sea, heavy squalls of hail and snow; in 43° N., 47° W., NW., fierce gale, tremendous sea, snow squalls; in 42° N., 45° W., NW. very heavy gale. 15th, in 47° N., 40° W., NW. and W., severe gales, high sea, violent squalls of snow and hail; in 43° 37' N., 48° 08' W., icebergs; in 45° N., 53° W., large fields of slab ice; in 45° 27' N., 22° 12' W., 29.63, SW., force 5, showery; in 36° N., 42° 55' W., 30.10, WSW., force 2, overcast; in 45° 37' N., 31° 14' W., 29.62, NW., force 3, cloudy; in 48° 17' N., 32° 27' W., 29.56 W., force 4, hail and snow squalls. 16th, in 46° 50' N., 19° 10' W., 29.64, SW., force 5, showery; in 49° 23' N., 13° 36' W., 29.55, WSW., 4, moderate westerly sea; in 49° N., 20° W., SE. to NW., stormy, with squalls of rain. During this day and the following the depression filled up off the western coast of the British Isles under the influence of a high pressure area 30.20 to 30.40 prevailing over those islands. No. XI.—This depression developed in western Dakota on the 8th as secondary area to No. IX. On the morning of the 9th was central in the northern portion of the Upper Lake Region, inclosed by the isobar of 29.80. 10th, central in the Lower St. Lawrence Valley with diminished energy. During the day the depression passed eastward over the Canadian Maritime Provinces and on the following morning combined with area of No. X, then central southeast of Newfoundland. No. XIII.—This depression developed during the 13th in the Lower Missouri Valley, and on the following morning was central in the Province of Ontario as an area of very slight energy, inclosed by the isobar of 30.00. During the day the depression passed rapidly southeastward over the Lower Lake Region, disappearing off the New England coast, and by the morning of the 15th became central in about 40° N. 55° W.; in 44° 26' N., 52° 58' W., 29.96, NW., force 6; in 42° 04' N., 53° 40' W., 29.36, NE., force 6. 16th, in 44° 28' N., 46° 20' W., NW. gale, high sea with violent squalls; in 46° 30' N., 38° 08' W., 29.37, NW., force 7, heavy snow and hail for three hours. 17th, in 47° 15' N., 39° 15' W., S., force 3, heavy sea; in 48° 19' N., 18° 52' W., 29.23, S., force 3, heavy rain; Angra, Azores, 29.56, a fall of 0.16 inch, W., light rain; in 37° N., 39° W., 29.54, SSW., force 3; in 49° 14' N., 15° 15' W., 29.56, SE., force 9,

high confused sea; in $45^{\circ} 08' N.$, $43^{\circ} 02' W.$, 29.77, NNW., force 4, rain for three hours; in $48^{\circ} N.$, $29^{\circ} W.$, SW to NW., severe gale, high sea; in $50^{\circ} N.$, $26^{\circ} W.$, SW., SE., and SSW., hard gale with squalls and showers; in $49^{\circ} N.$, $29^{\circ} W.$, SW. and S., strong gales, finally increased to heavy gale from the W., causing severe damage to vessel. 18th, in $50^{\circ} 55' N.$, $11^{\circ} 57' W.$, 29.89, ESE., force 6, misty; in $48^{\circ} 02' N.$, $24^{\circ} 14' W.$, WSW., force 2, high sea, rainy weather. During this day and the following the depression slowly filled up over the Bay of Biscay, under the influence of high pressures extending thence from western Europe. No. XVI.—This depression passed northward from the Gulf of Mexico during the latter part of the 14th, and on the following morning was central in Louisiana inclosed by the isobar of 29.90. During this day and the following the depression passed northeastward over Alabama, Tennessee and Virginia, reaching the Atlantic coast at about parallel $40^{\circ} N.$, on the afternoon of the 16th. By the morning of the 17th the depression became central in about $40^{\circ} N.$, $60^{\circ} W.$. In $41^{\circ} 05' N.$, $63^{\circ} 44' W.$, 29.54, N., force 4, cloudy. 18th, in $43^{\circ} 36' N.$, $49^{\circ} 19' W.$, 29.20, NNW., force 7, heavy rain for two hours; in $35^{\circ} 55' N.$, $54^{\circ} W.$, 29.84, NW., force 6, very high sea, violent squalls; in $43^{\circ} N.$, $45^{\circ} W.$, NW., strong gale, high sea; in $48^{\circ} N.$, $34^{\circ} W.$, W. and S., severe gales with frightfully high sea; in $48^{\circ} N.$, $33^{\circ} W.$, NW., strong gale, high sea; in $49^{\circ} N.$, $31^{\circ} W.$, W. and NW., fresh gale, squalls, showers and high seas. 19th, in $52^{\circ} 32' N.$, $27^{\circ} 05' W.$, 29.00, S., force 6; in $44^{\circ} 11' N.$, $45^{\circ} 28' W.$, 28.86, NW., force 10, tremendous sea; in $47^{\circ} N.$, $38^{\circ} W.$, S., SE. and NW., tremendous gales and very high sea; in $48^{\circ} N.$, $36^{\circ} W.$, W., SSW. and N., strong gales, squally, showers and high sea; in $47^{\circ} N.$, $37^{\circ} W.$, WSW. to NW., heavy gale, very high sea; in $47^{\circ} 40' N.$, $37^{\circ} 30' W.$, S., very heavy gale and tremendous high seas; in $46^{\circ} 57' N.$, $29^{\circ} 44' W.$, 29.37, WSW., force 6, heavy rain, very high sea. 20th, in $54^{\circ} 17' N.$, $19^{\circ} 46' W.$, 29.79, S., force 5. During this day and the following the depression filled up off the western coast of the British Isles; the pressure at land stations ranged from 30.20 to 30.46. No. XVII.—This depression entered the North Pacific Coast Region on the 16th, and passing thence southeastward to the Middle Plateau, was central near Salt Lake City on the morning of the 17th. On the 18th the depression passed eastward from the Lower Missouri Valley, and by the following morning became central in the western portion of the Middle Atlantic States. During the afternoon the center passed eastward off the coast accompanied by heavy gales and high seas south of $40^{\circ} N.$ and east of $72^{\circ} W.$. 19th, in $38^{\circ} 40' N.$, $65^{\circ} W.$, hurricane from NE., vessel hove on beam ends; in $37^{\circ} N.$, $66^{\circ} W.$, hurricane from SE. veering to NW., and lasting 24 hours; in about $39^{\circ} 10' N.$, $70^{\circ} 15' W.$, 9.30 p. m., terrific hurricane from NW. lasting one hour, vessel hove on beam ends and finally abandoned; in $30^{\circ} N.$, $61^{\circ} W.$, terrific SE. storm which veered around to SW. and NW., barometer 29.31, tremendous sea washing away everything moveable on deck; in $34^{\circ} N.$, $71^{\circ} W.$, strong gale from NW. and N., with hail and snow squalls; in $37^{\circ} N.$, $69^{\circ} W.$, during night, violent hurricane from WSW., scud under bare poles for three hours, decks swept. On the morning of the 20th the depression became central in about $40^{\circ} N.$, $60^{\circ} W.$. In $36^{\circ} 10' N.$, $61^{\circ} 25' W.$, 29.36, W., force 8, misty; in $42^{\circ} 07' N.$, $59^{\circ} 57' W.$, 28.77, NNW., force 9, very heavy sea, cloudy; in $40^{\circ} 01' N.$, $63^{\circ} 04' W.$, 28.53, WNW., force 10, moderate rain, tremendous sea, terrific storm; in $41^{\circ} N.$, $64^{\circ} W.$, NE. heavy gale, high sea; in $38^{\circ} N.$, $63^{\circ} W.$, terrible hurricane from SE. to NW., lasting 18 hours, followed by a heavy sea washing everything off deck; in $42^{\circ} 07' N.$, $59^{\circ} 57' W.$, 28.82, NNW., force 11, violent gales and squalls; in $40^{\circ} 01' N.$, $63^{\circ} 04' W.$, 28.53, N. by W., force 12, terrific gales and squalls; in $41^{\circ} N.$, $60^{\circ} W.$, hurricane lasting 24 hours, decks swept by heavy cross seas; in about $34^{\circ} N.$, $65^{\circ} W.$, terrific hurricane from NW., lasting 36 hours, everything movable on decks swept off; in $43^{\circ} N.$, $55^{\circ} W.$, ESE., strong gale, high sea; in $47^{\circ} N.$, $40^{\circ} W.$, NW., hard gale, squalls, showers and high sea;

in $46^{\circ} N.$, $40^{\circ} W.$, NW., heavy gale, very high sea; in $42^{\circ} 47' N.$, $56^{\circ} 54' W.$, 28.55 W. by S., force 11, terrible storm; in $38^{\circ} N.$, $62^{\circ} W.$, tremendous gale, vessel on beam ends and three men washed overboard; in $37^{\circ} 10' N.$, $58^{\circ} 30' W.$, hurricane from S. to NW., vessel abandoned; in $38^{\circ} N.$, $62^{\circ} 50' W.$, 9 a. m., hurricane from ESE. to SSW., heavy seas; 3 p. m., gale increasing; midnight, vessel complete wreck. 21st, in $43^{\circ} N.$, $50^{\circ} W.$, E. and NW., shifting strong winds, heavy storm; in $43^{\circ} N.$, $48^{\circ} W.$, winds shifting from S. to E., soon increasing to a heavy gale, after which, shifted from W. to NE.; in $42^{\circ} 36' N.$, $41^{\circ} 34' W.$, severe SW. gale carried away masts, swept decks, vessel finally abandoned; in $40^{\circ} 17' N.$, $46^{\circ} 35' W.$, severe gale from W., lasting 72 hours; in $36^{\circ} 25' N.$, $63^{\circ} 40' W.$, 29.88, WNW., force 3, showery; in $40^{\circ} 27' N.$, $65^{\circ} 55' W.$, 29.79, SE., force 2, light rain for three hours; in $40^{\circ} 47' N.$, $56^{\circ} 26' W.$, 29.58, N., force 7, very high northerly sea; in $44^{\circ} 59' N.$, $37^{\circ} 52' W.$, S., force 5, heavy rain, very high sea. 22d, in $44^{\circ} 11' N.$, $40^{\circ} 24' W.$, 29.46, NNE., force 8, heavy rain, very high sea; in $42^{\circ} 14' N.$, $44^{\circ} 01' W.$, 29.46, force 5, snow squalls, high sea; in $43^{\circ} N.$, $50^{\circ} W.$, N., strong gale, very high sea; in $42^{\circ} 30' N.$, $48^{\circ} W.$, passed three small icebergs; in $43^{\circ} N.$, $49^{\circ} 36' W.$, icebergs. 23d, in $50^{\circ} 16' N.$, $23^{\circ} 43' W.$, 29.41, S. force 5, light rain; in $43^{\circ} 23' N.$, $44^{\circ} 32' W.$, 29.42, WNW., force 6, heavy rain and high sea; in $44^{\circ} 36' N.$, $42^{\circ} 15' W.$, 29.28, NW., force 7, sleet, squally, very high sea; in $43^{\circ} 20' N.$, $49^{\circ} W.$, floe ice extending north and south as far as the eye could reach; in $43^{\circ} 39' N.$, $47^{\circ} 42' W.$, icebergs, some 30 feet high. 24th, in $48^{\circ} 55' N.$, $31^{\circ} 16' W.$, 29.06, E., force 2, cloudy; in $47^{\circ} 02' N.$, $36^{\circ} 01' W.$, 29.35, WNW., force 6, squally, very high sea; in $42^{\circ} 39' N.$, $49^{\circ} 22' W.$, 29.81, NNW., force 3, snow squalls. 25th, in $49^{\circ} N.$, $28^{\circ} 55' W.$, WNW., force 6, squally, very high sea; in $47^{\circ} 20' N.$, $37^{\circ} 16' W.$, 29.61, WNW., force 4, light rain; in $46^{\circ} N.$, $36^{\circ} W.$, NW. strong, very high sea ship labored heavily. 26th, in $50^{\circ} 29' N.$, $20^{\circ} 35' W.$, 29.60, S., force 6, raining. 27th, central off the northern coast of Spain; in $46^{\circ} 17' N.$, $7^{\circ} 16' W.$, 29.84, NE., force 4, drizzling; Bilbao, 29.88, a fall of 0.11 inch, SE., fair; Santiago, 29.76, a fall of 0.02 inch, SE., cloudy; Madrid, 29.84, a fall of 0.15 inch, SE., cloudy. During the 26th and 27th, rain, with SE. to SW. winds prevailed throughout Spain. 28th, depression central in southern Spain, lowest barometer at Murcia, 29.72, ESE., raining; Madrid, 29.93, a rise of 0.09 inch, NE., raining. 29th, central in northeastern Algeria; Biskra, 29.55, a fall of 0.13 inch, SE., force 5, cloudy; Tebessa, 29.63 a fall of 0.17 inch, S., force 7, fair; La Calle, 29.60, a fall of 0.17 inch, NE., force 2, threatening. 30th, depression central over Sicily inclosed by the isobar of 29.60. During this day and the following disappeared to the southward over the Mediterranean. No. XX.—This depression appeared in the vicinity of Hudson's Bay on the 18th, and by the following morning was central south of York Factory, barometer, 29.30 a fall of 0.29 inch, N., 27 miles per hour, drifting snow. During the 20th the depression passed rapidly southeastward over Canada and northern New England accompanied by threatening weather and snow in the former. By the morning of the 21st the depression became central over the ocean southwest of Nova Scotia, combining thereafter with area No. XVII. No. XXI.—Appearing northwest of Manitoba on the 20th, this depression passed southeastward over that region during the day. 21st, central north of Lake Superior inclosed by the isobar of 30.00; lowest barometer at Marquette 29.94, a fall of 0.16 inch, W., cloudy. 22d, central in the Lower St. Lawrence Valley, inclosed by the isobar of 29.90. During the day the depression disappeared to the eastward over the Gulf of St. Lawrence. No. XXII.—This depression appeared in Manitoba on the 22d; Fort Garry, 29.68, a fall of 0.35 inch, SE., 16 miles per hour, cloudy; Pembina, 29.60, a fall of 0.38 inch, S., fair. 23d, depression central north of Lake Huron, Parry Sound, 29.64, a fall of 0.30 inch, SE. heavy snow; Alpena, 29.60, a fall of 0.43 inch, W., fair; Rockliffe, 29.69, a fall of 0.21 inch, E., threatening. 24th, depression central off the New England coast followed by northwesterly

winds and snow westward to the Lake Region, and northeasterly winds with cloudy and threatening weather in the Canadian Maritime Provinces. Portland, Me., 29.45, a fall of 0.46 inch, W., fair; Boston, 29.55, a fall of 0.43 inch, NW., fair; Eastport, 29.62, a fall of 0.18 inch, E., 22 miles per hour, cloudy; Quebec, 29.74, a fall of 0.15 inch, E., gale, heavy snow. The following reports show the severity of the storm over the ocean: In 37° 15' N., 70° 50' W., 29.75, NW., force 6, overcast; in 39° 40' N., 72° W., 29.72, NW., force 6; in 39° 10' N., 67° W., terrific gale from NW., accompanied by heavy rain and thunder with vivid lightning, heavy cross sea sweeping decks; off Barnegat, N. J., severe gale from S., lasting 24 hours; 40 miles ESE. of Cape Cod, violent gale from WNW., with heavy cross sea; in 37° 26' N., 61° W., SW., strong gale, with heavy squalls, increasing to heavy gale with high cross sea. 25th, in 33° N., 72° W., violent SW. to NW. storm, vessel struck by lightning; in 41° N., 67° W., SE., NW and N., strong gales, snow squalls, high sea; in 41° 40' N., 62° W., variable, heavy gales, snow squalls, hard frost, very high sea; in 45° 25' N., 49° W., (from Cardiff to New York,) up to this position vessel had passed through 180 miles of ice, encountered heavy drift ice and over 100 icebergs; in 37° 05' N., 66° 25' W., 29.76, W., force 8, squally; off Sandy Hook, 30.21, NW., force 4, squally; in 42° 02' N., 54° 52' W., 29.34, W., force 4, very high sea, rainy. 26th, in 36° 28' N., 41° 24' W., 29.97, SW., force 6, raining; in 37° N., 62° 10' W., 29.84, WNW., force 7, very high sea, hailing; in 45° 28' N., 43° 23' W., 29.35, SSW., force 4, light rain; in 41° 34' N., 58° 23' W., 29.47, NW., force 6, very high sea, rain squalls; in 43° N., 53° W., westerly gale, rain squalls; in 39° N., 61° W., fearful NW. gale. 27th, in 36° 34' N., 71° 30' W., violent southwest gale, lost sails and boats; in 37° N., 47° W., hurricane from SW. to NW., lasting 36 hours, barometer fell to 28.70, decks swept; in 38° 54' N., 38° 35' W., 29.98, SW., force 6, drizzling; in 37° 05' N., 57° 40' W., 30.03, W., force 7, very high sea, cloudy; in 43° 13' N., 49° 27' W., 29.51, W., force 2, light rain; in 40° 02' N., 62° 05' W., 29.98, WNW., force 5, snow squalls. 28th, depression central in about 50° N., 40° W., inclosed by the isobar of 29.80. 29th, in 53° N., 27° W., S. to W. strong gale; in 52° 59' N., 26° 35' W., 29.66, NNW., force 3, fair. 30th, in 51° 49' N., 30° 43' W., 29.45, NW., force 6, very heavy sea, fair weather; Stykisholm, Iceland, 29.01, a fall of 0.78 inch, SE., force 9, snowing. 31st, depression central west of Iceland; Stykisholm, 28.57, a fall of 0.44 inch, SE., force 2, snowing; Thorshavn, 29.03, a fall of 0.65 inch, SE., force 9, raining; Godthaab, 29.71, a rise of 0.11 inch, NNW., force 4, snowing. Throughout the northern portion of the British Isles the pressure fell from 0.20 to 0.60 inch, and the winds shifted to south and southeast, with velocities ranging from 20 to 50 miles per hour. The continuation of this storm will appear upon chart No. V for April, 1880. No. XXV.—This depression entered the coast of British Columbia on the 24th; in 40° 54' N., 133° 02' W., 29.58, NW., force 6, fair; in 48° 21' N., 124° 04' W., 29.49, ESE., force 6, threatening; Olympia, 29.60, a fall of 0.26 inch, W., cloudy. 25th, depression central in the Northern Plateau; Boise City, 29.87, NW., cloudy; Winnemucca, 29.74, a fall of 0.07 inch, W., light snow; Salt Lake City, 29.70, a fall of 0.18 inch, SE., clear. 26th, depression central in the southern portion of the Northern Rocky Mountain Region. Cheyenne, 29.46, a fall of 0.34 inch, W., clear; North Platte, 28.99, a fall of 0.51 inch, S., hazy; Dodge City, 29.09, a fall of 0.26 inch, S., cloudy. 27th, depression central in the Upper Mississippi Valley, inclosed by the isobar of 29.00. St. Louis, 29.16, a fall of 0.62 inch, SE., fair; Keokuk, 28.93, a fall of 0.77 inch, W., cloudy; Davenport, 28.91, a fall of 0.89 inch, SE., light rain; Des Moines, 29.16, a fall of 0.47 inch, NW., light rain. During the day the depression passed rapidly eastward over the Ohio Valley and Middle Atlantic States and by the morning of the 28th, became central off the Atlantic coast in about 40° N., 70° W. Heavy southwest to northwest gales, ranging from 30 to 60 miles per hour, prevailed at coast sta-

tions between the parallels of 34° and 40° N.; northward to 45° N., northeasterly gales prevailed. In 33° N., 72° 10' W., 29.57, SW., hurricane, very high sea, raining; in 42° 28' N., 54° 57' W., 29.62, S., force 1, heavy rain during past 24 hours, hazy; in 40° 55' N., 66° 30' W., 29.10, SW., force 2, heavy rain in past 24 hours, very high sea, misty; in about 34° N., 73° 40' W., 29.30, WSW., force 5; in 34° 49' N., 75° 27' W., 29.49, W., force 3, very rough sea; in 34° 49' N., 75° 27' W., 29.56, violent westerly gale; in 42° N., 63° W., rain and sleet, very unsettled weather with high SW. sea, heavy westerly gale with cross seas; in 36° N., 60° W., very heavy westerly gale. 29th, in 33° 45' N., 70° 10' W., 29.48, NW., force 7, very high sea, raining; in 39° 40' N., 49° 15' W., 29.79, SW., force 7, very high sea overcast; in 41° 48' N., 59° 35' W., 29.22, WNW., force 4, very rough sea, cloudy; in 40° 10' N., 72° 49' W., 29.66, NE., force 4, cloudy; in 35° 31' N., 74° 35' W., 29.66, NNW., force 5, very rough sea, threatening; in 42° N., 61° W., very heavy storm from SW., tremendous gale, very high sea; in 41° 39' N., 60° W., SW. to NW., strong gale, very high sea; in 42° N., 59° W., 29.28, heavy westerly gales. 30th, in 43° 27' N., 43° W., violent westerly gale, dense fog; in 34° N., 67° 50' W., 29.31, N., force 8, very high sea, raining; in 40° 50' N., 45° W., 29.93, SSW., force 5, high sea, rain and fog; in 40° 57' N., 66° 40' W., 29.39, NE., force 6, light rain, very rough sea; in 35° 21' N., 73° 18' W., 29.76, N., 35 miles per hour, very rough sea, stormy. 31st, in 33° 25' N., 65° 20' W., 29.68, WNW., force 6, very high sea, showery; in 42° 05' N., 40° 55' W., 29.98, S., force 4, foggy; off Sandy Hook, 29.75, NW., force 3, clear; Little Glace Bay, N. S., 29.20, a fall of 0.70 inch, SE., 10 miles, raining; Sidney, C. B., 29.26, a fall of 0.65 inch, NE., 14 miles, sleeting; Windsor, N. S., 29.35, a fall of 0.56 inch, N., 29 miles, cloudy; Charlottetown, P. E. Island, 29.41 a fall of 0.47 inch, N., 30 miles, light snow. The continuation of this storm will appear on chart No. V for April 1880. No. XXVI.—This depression appeared off the coast of Washington Territory on the 27th, accompanied by light to heavy rains with southerly winds in the North Pacific Coast Region. 28th, depression central in the Northern Plateau inclosed by the isobar of 29.80. Winnemucca, 29.73, a fall of 0.24 inch, SW., 40 miles per hour, cloudy. During the day the depression remained about stationary, but on the 29th it passed quite rapidly southeastward and by the morning of the 30th became central in the Middle Rocky Mountain Slope. North Platte, 29.30, a fall of 0.35 inch, E., cloudy; Dodge City, 29.36, a fall of 0.32 inch, SE., clear. Changing its course to the northward during the day, the depression on the morning of the 31st became central in the northern portion of the Upper Mississippi Valley inclosed by the isobar of 29.80 and accompanied by southerly winds and light rain. The continuation of this storm will probably appear on chart No. V for April, 1880. Of the storms entering northern Europe the following are briefly described. No. II.—The barometer remained low north of the British Isles after the passage eastward of area No. XVI, chart No. V, for February, 1880, and on the morning of the 1st an area of 28.40 embraced the Orkney and Shetland Islands. North Unst, 28.21, a fall of 0.64 inch, SW., force 8, cloudy. Barometer at all stations in northern Scotland below 28.90, and throughout the remainder of the British Isles below 29.40; winds southwesterly and ranging in velocities from 20 to 45 miles per hour. During the 1st and 2d the depression remained about stationary, but on the 3d moved slowly eastward into southern Norway, where it became central on the morning of the 4th with diminished energy and higher pressure. Bergen, 29.03, a rise of 0.27 inch, WNW., fair; Christiania, 29.11, a rise of 0.26 inch, SSE., foggy; Wisby, 29.16, a rise of 0.13 inch, NW., force 4, cloudy; North Unst, 29.09, a rise of 0.56 inch, NW., force 6, fair. During the day the depression moved rapidly eastward over the Baltic into western Russia, becoming central on the morning of the 5th southeast of the Gulf of Finland. St. Petersburg, 29.35, a rise of 0.69 inch, NNE., raining; Moscow, 29.24, a fall of 0.18 inch, S., snowing; Kieff, 29.44, a fall of 0.07 inch, NW., 18 miles, cloudy; Lugan,

29.38, a fall of 0.53 inch, SSE., cloudy. During the day the depression remained about stationary, and continued a sluggish movement eastward with diminishing energy, until the 8th, when combining with No. VII. near the Ural Mountains, the central area became inclosed by the isobar of 29.00 and the intensity of the storm greatly augmented. Kasan, 29.09, a fall of 0.54 inch, SW., 7 miles, snowing; Ekaterinburg, 28.92, a fall of 0.70 inch, NNW., cloudy. 9th, depression central in the valley of the Obi. Ekaterinburg, 29.13, a rise of 0.21 inch, N., snowing; Barnaul, 29.71, a rise of 0.02 inch, SW., cloudy; Yeniseisk, 29.33 a fall of 0.54 inch, WSW., 25 miles, rain and snow. 10th, depression central in the valley of the Yenisei. Yeniseisk, 29.61, S., 7 miles, cloudy. During the day the depression disappeared to the eastward over northern Siberia. No. III.—This depression appeared in northwestern Russia on the 1st as a continuation of area No. XVI. of Chart No. V. for February, 1880. 1st, Archangel, 28.86, a rise of 0.17 inch, S., light snow; Kasan, 28.94, a fall of 0.66 inch, S., 13 miles, cloudy; Moscow, 29.28, a rise of 0.18 inch, ESE., 13 miles, cloudy; Ekaterinburg, 29.48, a fall of 0.30 inch, S., 9 miles, snowing. 2nd, depression central east of the Ural Mountains. Ekaterinburg, 29.38, a fall of 0.10 inch, W., 7 miles, snowing. 3rd, Barnaul, 29.86, a fall of 0.23 inch, SW., 13 miles, light rain; Ekaterinburg, 29.90, a rise of 0.52 inch, SW., cloudy. During the day the depression disappeared east of the Yenisei. 4th, Yeniseisk, 30.10, SW., clear; Barnaul, 30.31, SW., cloudy. No. V.—This depression appeared on the 3rd over eastern Lapland. Archangel, 28.69, a fall of 0.39 inch, SSW., 13 miles, cloudy. 4th, depression central between the Gulf of Finland and the White Sea. St. Petersburg, 28.96, a fall of 0.19 inch, SSW., light rain; Dorpat, 29.00, a fall of 0.19 inch, WSW., cloudy; Moscow, 29.42, a fall of 0.19 inch, E., cloudy. On the 5th this depression combined with area No. II. No. VII.—This depression appeared off the northwestern coast of Norway on the 5th, becoming central on the following morning in northern Scandinavia inclosed by the isobar of 29.20; Tromso, 29.19, a fall of 0.23 inch, NE., 34 miles, snowing; Brono, 29.55, a fall of 0.10 inch, NW., 22 miles, cloudy; Bergen, 29.69 a fall of 0.02 inch, S., 17 miles, raining; Haparanda, 29.46, a fall of 0.22 inch, S., force 4, cloudy. 7th, central over the White Sea. Archangel, 29.24, a fall of 0.49 inch, SSW., snowing; St. Petersburg, 29.42, a fall of 0.42 inch, WSW., snowing. On the 8th this depression combined with area No. II, then central in eastern Russia. No. XII.—This depression entered northern Scandinavia on the 9th. Tromso, 29.15, a fall of 0.65 inch, SE., raining; Haparanda, 29.30, a fall of 1.05 inches, W., force 6, clear; Archangel, 29.44, a fall of 0.37 inch, cloudy. 10th, depression central in Finland. Archangel, 29.08, a fall of 0.36 inch, E., 13 miles, snowing; St. Petersburg, 29.42, a fall of 0.28 inch, W., 18 miles, cloudy; Haparanda, 29.40, a rise of 0.10 inch, NW., force 6, clear. 11th, depression central in about 60° N., 60° E., inclosed by the isobar of 29.00. Ekaterinburg, 28.84, a fall of 0.63 inch, SW., 31 miles, drifting snow; Kasan, 29.10, a fall of 0.44 inch, NNW., 20 miles, cloudy; Archangel, 29.63 a rise of 0.55 inch, NW., 13 miles, cloudy. 12th, depression central with diminished energy in the valley of the Obi, disappearing during the day over northern Siberia. No. XIV.—This depression appeared east of the White sea on the 14th, inclosed by the isobar of 29.60. On the 15th a barometric trough of 29.60 ran southeastward to the Caspian sea. 16th, central in eastern Russia near Kasan, barometer 29.40, a fall of 0.35 inch, SSE., cloudy; Ekaterinburg, 29.45, a fall of 0.42 inch, E., cloudy. During the 17th and 18th the depression remained about stationary in this region with slowly rising pressure at the centre. 19th, central in the valley of the Obi, with rapidly increasing pressure and by the following morning had disappeared in a high pressure area, 30.40 over western Siberia. No. XIX.—This depression appeared to form south of the Gulf of Finland on the 19th. St. Petersburg, 29.55, a fall of 0.46 inch, N., 16 miles, cloudy; Dorpat, 29.69, a fall of 0.51 inch, N., 20 miles, cloudy; Moscow, 29.54,

a fall of 0.32 inch, SSE., 13 miles, light snow; Wilna, 29.87, a fall of 0.41 inch, WSW., snowing. 20th, Moscow, 29.59, a rise of 0.05 inch, N., cloudy; Wilna, 30.01, a rise of 0.14 inch, N., heavy clouds; Kieff, 29.71, a fall of 0.20 inch, NW., cloudy; Kasan, 29.56, a rise of 0.02 inch, SSE., light snow. 21st, depression central north of the Caspian sea. Astrakhan, 29.67, a fall of 0.46 inch, N., heavy clouds; Tiflis, 29.64, a fall of 0.50 inch, SW., cloudy. During the day the course of the storm changed to the northeast and by the following morning the depression was central in the valley of the Obi. Ekaterinburg, 29.53, a fall of 0.11 inch, WSW., cloudy; Barnaul, 29.80, a fall of 0.44 inch, calm, cloudy. 23rd, central in the valley of the Yenisei, north of parallel 60° N. Yeniseisk, 29.02, a fall of 1.05 inches, SSE., 11 miles, snowing. The continuation of this depression could not be traced owing to the lack of reports from northern Siberia. No. XXIV.—This depression appeared over Finland, on the 23rd, and by the morning of the 24th had passed eastward to about 60° N., 40° E. Archangel, 29.24, a fall of 0.34 inch, WNW., 18 miles, cloudy; Moscow, 29.67, a fall of 0.45 inch, W., cloudy; Kasan, 29.56, a fall of 0.25 inch, SW., 31 miles, cloudy; Ekaterinburg, 29.46, a fall of 0.05 inch, SW., 27 miles, drifting snow. 25th, a barometric trough of 29.60 extended from about 60° N., 60° E., southwestward across Russia to the Black Sea; lowest barometer at Kasan, 29.47, a fall of 0.09 inch, SSE., snowing; Moscow, 29.60, a fall of 0.07 inch, N., snowing; Nikolaiev, 29.92, a fall of 0.44 inch, NNW., 31 miles, sleeting. 26th, depression central in about 60° N., 50° E. Archangel, 29.35, a fall of 0.54 inch, W., 22 miles, snowing; Kasan, 29.58, a rise of 0.11 inch, SSE., snowing. 27th, central in about 60° N., 60° E. Ekaterinburg, 29.27, a fall of 0.41 inch, SW., cloudy; Kasan, 29.31, a fall of 0.27 inch, SSW., cloudy. 28th, central in the valley of the Obi. Ekaterinburg, 29.15, a fall of 0.12 inch, SSW., 18 miles snowing. During the day this depression disappeared in western Siberia under the influence of a high pressure area 30.20. No. XXVIII.—After the disappearance of area No. XXIV the pressure still remained low north of 60° N. and between the parallels of 40° and 60° E. 29th, Archangel, 29.39, WNW., 22 miles, light snow; Kasan, 29.36, NW., 22 miles, cloudy; Ekaterinburg, 29.44, SW., cloudy. 30th, depression central with diminished energy in northeastern Russia, inclosed by the isobar of 29.80. 31st, depression disappeared in northwestern Siberia, under the influence of a high pressure area, 30.20. Concerning the storms off the Asiatic coast the following brief descriptions are given: No. XV.—On the morning of the 15th the barometer at Pekin read 29.80, a fall of 0.31 inch, SW., clear. 16th depression central over the Japan Sea; barometer at Japanese stations fell from 0.08 to 0.15 inch, with cloudy and rainy weather. During the day the depression disappeared eastward over the ocean. No. XVIII.—This depression appeared over the Yellow Sea on the 18th and by the following morning became central north of the island of Nippon. 19th, Wakayama, 29.32, a fall of 0.70 inch, S., 20 miles per hour, 1.37 inches rain-fall in past 24 hours, cloudy; Tokei, 29.59, a fall of 0.48 inch, S., 20 miles per hour, 1.54 inches rain-fall in past 24 hours, light rain; Hiroshima, 29.56, a fall of 0.46 inch, N., 16 miles per hour, 0.91 inch rain-fall in past 24 hours, fair; Nagasaki, 29.81, a fall of 0.19 inch, WNW., 1.02 inches rain-fall in past 24 hours, clear; 20th, depression central over the ocean, followed at land stations by a rise in barometer of from 0.30 to 0.85 inch, winds shifting to northerly, with clearing weather. No. XXIII.—This depression was probably central southeast of the Leu Cheu Islands on the 22d. By morning of the 23d, in pursuing a course northeastward, the depression had reached a position north of the Bonin Islands. At most stations on the Island of Nippon the winds shifted to northerly, with rapidly falling barometer. Tokei, 29.58, a fall of 0.67 inch, NNW., 15 miles per hour, 1.05 inches rain-fall in past 24 hours, light rain; Wakayama, 30.05, a fall of 0.11 inch, NNW., fair; in 33° 44' N., 137° 57' E., 29.70 NW., force 6, rough sea, squally weather. 24th, Tokei, 30.08, a rise of 0.50 inch, NNW., clear; Wakayama, 30.28, a rise of 0.23

inch, N., clear; Hiroshima, 30.33, a rise of 0.11 inch, NNE., clear; Nagasaki, 30.37, a rise of 0.11 inch, NNE., clear. During the day the depression disappeared eastward over the ocean. No. XXVII.—This depression appeared in southeastern China on the 28th. S. S. *Monocacy*, U. S. N., at Shanghai, barometer 29.80, a fall of 0.22 inch, S., force 1, clear; S. S. *Palos*, U. S. N., at Shanghai, barometer 29.83, a fall of 0.22 inch, SSE., force 2, cloudy. 29th, position of central disturbance uncertain, probably south of the Island of Kinsin. Hiroshima, 29.98, a fall of 0.03 inch, NNE., fair; Nagasaki, 30.01, N., threatening; Tokei, 29.65, a fall of 0.35 inch, NW., 13 miles, 1.22 inches rain-fall in past 24 hours, raining; Wakayama, 29.86, a fall of 0.19 inch, NW., cloudy. 30th, Hiroshima, 29.88, a fall of 0.10 inch, W., fair; Nagasaki, 29.87, a fall of 0.14 inch, SE., clear; Tokei, 30.05, a rise of 0.40 inch, ENE., cloudy; Wakayama, 29.94, a rise of 0.08 inch, N., cloudy. 31st, Hiroshima, 29.88, no change, N., fair; Nagasaki, 29.99, a rise of 0.12 inch, WNW., clear; Wakayama, 29.73, a fall of 0.21 inch, WNW., 13 miles, clear; Tokei, 29.43, a fall of 0.62 inch, 17.78 m.m. rain-fall in past 24 hours, cloudy. April 1st, Hiroshima, 30.03, a rise of 0.15 inch, NNE., clear; Wakayama, 30.01, a rise of 0.28 inch, N., cloudy; Tokei, 29.87, a rise of 0.44 inch, NNW., clear. During the previous day the depression disappeared eastward over the ocean.

Ocean Ice.—January 30th, 1882. In 47° 30' N., 48° 35' W., S. S. *Glamorgan* passed large iceberg about 40 feet high. On February 1st, the same steamer passed in 46° 43' N., 52° 24' W., a great quantity of field ice extending 40 miles in length. 9th, in 47° 30' N., 47° W., S. S. *Averill*, reported a large quantity of field ice and several large icebergs. 11th, in 46° 30' N., 45° 30' W., S. S. *Australia*, passed through large quantities of field ice and saw several icebergs; in 46° 34' N., 48° 37' W., S. S. *Pollax* reported large quantities of field ice; in 47° 19' N., 47° 18' W., S. S. *Vandalia*, reported large quantities of field ice; in 46° N., 46° W., S. S. *Brooklyn City* saw large iceberg and four hours later large packs of ice. 15th, in 47° 05' N., 44° 30' W., S. S. *P. Caland* passed large iceberg and considerable quantities of floating ice up to 45° 40' N., 46° 43' W. 16th, in 47° 50' N., 46° 30' W., S. S. *Thingvall* passed large quantities of field ice and several icebergs; in 46° 20' N., 47° 18' W., S. S. *Assyrian* passed large iceberg. 17th, in 47° 10' N., 46° 50' W., S. S. *Ethiopia* passed iceberg and large quantities of field ice. 18th, in 46° 20' N., 45° 55' W., in 46° N., 46° 55' W., and in 46° 20' N., 47° 16' W., S. S. *Bolivia* passed several large icebergs; in 45° 57' N., 47° 54' W., S. S. *The Queen* passed large iceberg and field ice. 19th, in 46° 10' N., 46° 30' W., S. S. *Cimbria* passed large quantities of field ice, vessel compelled to sheer south for 12 hours; in 47° 40' N., 43° 28' W., S. S. *State of Indiana* passed large iceberg. 20th, in 46° 21' N., 41° 40' W., S. S. *Cornwall* passed several large icebergs and some field ice; in 46° 30' N., 47° 25' W., S. S. *Plantyn* passed iceberg about 100 feet in height, and four hours afterward a large ice island; Brig *Trusty* at Trepassy from Crookhaven, passed 300 miles of drift ice off the coast of Newfoundland. 21st, in 45° 19' N., 49° 58' W., S. S. *Cornwall* passed several large icebergs and some field ice.

TEMPERATURE OF THE AIR.

The distribution of mean atmospheric temperature over the United States and Canada for the month of February, 1882, is exhibited by lines of equal thermometric mean values upon chart No. II. The table of mean and comparative temperatures in the right-hand corner of the chart shows, in the first column, the average for the month throughout the various districts, as deduced principally from observations taken at Signal Service stations. In the two remaining columns are shown the means for the present month, and the departures of such means from the average for many years. The temperature is everywhere above the normal east of the 107th meridian, the departures of excess ranging from 2°.5 in New England to 9°.9 in the Upper Mississippi Valley. Six districts report a mean temperature, which on the average is 8° or more above

the normal. Throughout the remainder of the country the temperature is below the normal, the departures of deficiency ranging from 1°.7 in the Southern Plateau to 7°.2 in the Middle Plateau. All of the districts but one, comprising this area, report a mean temperature which on the average is nearly 6° below the normal. As a means of interesting comparison, the following maximum departures from the normal are given for each year since 1874, together with the corresponding districts: 1875, -17°, Minnesota and -15°.2 Upper Lake Region; 1876, +4°.7 Lower Missouri Valley and +4°.6 Upper Mississippi Valley; 1877, +13°.4 Minnesota, +11°.5 Upper Mississippi Valley and +10°.9 Lower Missouri Valley; 1878, +18°.7 Minnesota, +16°.4 Upper Missouri Valley and +13°.3 Upper Mississippi Valley; 1879, +8°.3 Salt Lake City, +7°.1 Tucson and -6°.4 St. Lawrence Valley; 1880, +6°.5 Lower Lake Region, +6°.2 Middle Atlantic States and -5°.3 Northern Rocky Mountain Slope; 1881, -6°.0 Missouri Valley, -5°.0 Middle Rocky Mountain Slope and Upper Mississippi Valley and +6°.3 Salt Lake City.

Departures from Mean Temperatures.—Under this heading departures exhibited by the reports from the regular Signal Service stations are shown in the table of comparative temperatures on the right-hand side of chart No. II. The following items of importance, in connection with this subject, are reported by Voluntary Observers: *Illinois*: Riley, mean temperature, the highest ever recorded at this place, being 10°.2 above the mean of February for the past 21 years, and 1°.6 above the highest monthly mean previously recorded, which occurred in 1878. Its maximum temperature has not been exceeded during that period, but was just equaled in February, 1861. Mean temperature of winter of 1881-2 is 27° 8 or 6° 8 above the average of the past 19 winters; only the winters of 1870-1 and 1877-8 were warmer; the mean temperature of the winter of 1862-3 was just equal. The maximum temperature of past winter has only been exceeded once, viz., in December, 1877; the minimum of each winter during the past 19 years has been lower than that of the past winter. *Indiana*: Vevay, mean temperature, 45° 52 or 10° above the average of the past 17 years, and 19° 5 above the mean of the coldest month (February, 1875) which was reported during that period. Maximum temperature for February, 1882, is 5° lower than that of 1866 and 1869. *Iowa*: Clinton, mean temperature nearly 12° above the average. *Kansas*: Manhattan, mean temperature 40° 4 or 8° 09 above the average of the past 22 years; highest mean during that period, 39° 18, occurred in 1878, and the next highest, 36° 93, occurred in 1876. *Wellington*, mean temperature 40° 1 or 6° 2 above the average of the past 3 years. *Lawrence*, mean temperature 41° 65 or 8° 66 above the average of the past 14 years; during that period the highest mean, 40° 22, occurred in 1878, and the lowest, 25° 78, occurred in 1881. *Yates Centre*, mean temperature, 39° 6 or 9° 6 above the mean of past 2 years. *Maine*: Gardiner, mean temperature 21° 13 or 0° 53 above the average of the past 46 years. *Maryland*: Fallston, mean temperature, 36° 8, which is the highest, with the exception of 1880, that has occurred during the past 12 years. *Michigan*: Thornville, mean temperature fully 10° above the average of the past 15 years. *Missouri*: St. Louis, Missouri Weather Service reports mean temperature 43° 8 or 8° 6 above the average of the past 45 years; 0° 3 below the mean of the warmest February, which occurred in 1845, and 23° above the mean of the coldest February, which occurred in 1838. *New Hampshire*: Contoocookville, mean temperature 25° 3 or nearly 3° 0 above the February average for the past 12 years. *New York*: North Volney, mean temperature 28° 39 or 6° 34 above the average of the past 13 years; the highest February mean for that period, 27° 93, occurred in 1877, and the lowest mean, 13° 19, occurred in 1875; mean temperature for winter of 1881-2 at 7 a. m., 25° 16; 2 p. m., 32° 47; 9 p. m., 27° 58; mean for winter, 28° 14; average winter mean for past 13 years, 23° 21; highest winter mean, 28° 67, occurred in 1880; lowest winter mean, 17° 79, occurred in 1875. *Palermo*, mean temperature, 26° 4 or 5° above the average of February for the past 29 years;

during that period the highest mean, 27°.6, occurred in 1878; lowest 12°.6 occurred in 1875. *Ohio*: Cleveland, mean temperature 37°.53, which has not been equaled or exceeded during the past 27 years, and is 8°.56 above the average for that period; the lowest February mean 17°.01 oc-

Table of Maximum and Minimum Temperatures for February, 1882.

State or Territory.	Signal Service.			U. S. Army Post Surgeons or Voluntary Observers.		
	Station.	Max.	Min.	Station.	Max.	Min.
Alabama.....	Montgomery.....	20	32	Auburn.....	0	30
Arizona.....	Tucson.....	74	5	Maricopa.....	32	15
Do.....	Prescott.....	77	5	Mount Ida.....	70	16
Arkansas.....	Little Rock.....	77	29	Fort Yuma.....	78	16
California.....	Los Angeles.....	77	29	Fort Bidwell.....	78	12
Do.....	Campo.....	77	17	Fort Lyon.....	69	18
Colorado.....	West Las Animas.....	68	4	Fort G. Lund.....	62	18
Do.....	Pike's Peak.....	68	-17	Southington.....	62	5
Connecticut.....	New London.....	65	7	Fort Randall and Olivet.....	70	26
Do.....	New Haven.....	67	7	Fort Barrancas.....	80	26
Dakota.....	Ft. Sully.....	67	-35	Quitman and Thomasville.....	80	26
Do.....	Ft. Stevenson.....	61	24	Genesee.....	78	2
Delaware.....	Breakwater.....	61	24	Elmira.....	68	2.5
District of Columbia.....	Washington.....	62	20	Riley.....	68	12
Florida.....	Key West.....	85	37	Logansport.....	68	12
Do.....	Pensacola.....	78	31	Wabash.....	72	12
Georgia.....	Augusta.....	78	31	Cedar Rapids.....	72	-12
Do.....	Savannah.....	78	31	Cresco.....	76	-12
Do.....	Atlanta.....	78	31	Clay Centre and Ft. Scott.....	76	-5
Idaho.....	Ft. Lapwai.....	55	-29	Ft. Wallace.....	68	20
Do.....	Eagle Rock.....	72	11	Bowling Green.....	68	20
Illinois.....	Springfield.....	72	11	Cornish and Orono.....	62	-8
Do.....	Champaign and Chicago.....	65	15	Dexter.....	64	-9
Indiana.....	Indianapolis.....	65	15	Federalsburg.....	64	-9
Do.....	Fort Supply.....	75	12	Deer Park.....	64	-10
Iowa.....	Keokuk.....	69	1	Westborough.....	68	-11
Do.....	Des Moines.....	69	7	Niles.....	68	-11
Kansas.....	Dodge City.....	69	7	Fort Brady.....	68	-11
Do.....	Leavenworth.....	69	7	Ft. Snelling.....	68	-11
Kentucky.....	Louisville.....	67	20	Fayette.....	78	28
Louisiana.....	New Orleans.....	79	23	Proctor.....	75	8
Do.....	Shreveport.....	44	-5	Sedalia.....	68	-7
Maine.....	Eastport.....	44	-5	Geneva.....	63	-10
Do.....	Baltimore.....	69	3	Golconda.....	63	-10
Maryland.....	Baltimore.....	69	3	Hillel.....	63	-10
Massachusetts.....	Boston.....	60	3	Conococheville.....	63	-10
Do.....	Springfield.....	68	3	Grafton.....	62	-6
Michigan.....	Detroit.....	68	3	South Orange.....	62	-6
Do.....	Alpena and Marquette.....	57	2	Somerville.....	60	8
Minnesota.....	St. Paul.....	57	-35	Ft. Union.....	60	8
Do.....	St. Vincent.....	80	32	Johnstown.....	60	-10.6
Mississippi.....	Vicksburg.....	73	13	Lenoir.....	60	18
Missouri.....	Saint Louis.....	73	13	Westerville.....	60	8
Do.....	Springfield.....	62	-37	Ft. Klamath.....	60	-25
Montana.....	Fort Benton.....	62	-37	Dyberry.....	60	-2
Do.....	Terry's Landing.....	68	-4	Ft. Adams.....	60	8
Nebraska.....	North Platte.....	68	-4	Columbia.....	60	28
Nevada.....	Pioche.....	61	-17	Kelton.....	60	-23
Do.....	Winnemucca.....	61	-17	Charlotte.....	60	-15
New Hampshire.....	Mt. Washington.....	35	-21	Lunenburg.....	60	-15
Do.....	Sandy Hook.....	59	18	Wytheville.....	60	-12
New Jersey.....	Birney.....	72	11	Helvetia.....	60	-12
Do.....	La Mesilla.....	62	7	Neillsville.....	60	-28
New Mexico.....	Santa Fe.....	62	7	Ft. Washakie.....	60	-28
Do.....	New York City.....	62	7			
New York.....	Albany.....	77	24			
North Carolina.....	Wilmington.....	64	17			
Do.....	Cincinnati.....	64	17			
Ohio.....	Cincinnati.....	64	17			
Do.....	Cincinnati.....	64	17			
Oregon.....	Umatilla.....	55	4			
Pennsylvania.....	Pittsburg.....	60	18			
Do.....	Philadelphia.....	60	18			
Rhode Island.....	Newport.....	65	10			
South Carolina.....	Charleston.....	78	32			
Tennessee.....	Memphis.....	76	25			
Do.....	Knoxville.....	76	25			
Do.....	Nashville.....	76	25			
Texas.....	Rio Grande City.....	93	13			
Do.....	Fort Elliott.....	61	4			
Utah.....	Salt Lake City.....	61	4			
Vermont.....	Burlington.....	61	4			
Do.....	Cape Henry.....	74	19			
Virginia.....	Fort Myer.....	61	19			
Do.....	Albany.....	61	19			
Washington Ter.....	Spokane Falls.....	70	-14			
Do.....	Morgantown.....	65	3			
West Virginia.....	La Crosse.....	65	3			
Wisconsin.....	La Crosse.....	65	3			
Wyoming.....	Cheyenne.....	55	4			

curred in 1875. *Pennsylvania*: Wellsboro month will long be remembered as most exceptionally warm; mean temperature 32°.4 has not been equaled or exceeded during the past 20 years. *Texas*: Clarksville, mean temperature 59°.4, the high-

est that has occurred during the past 12 years. *Utah*: Coalville, mean temperature about 5° below the average of February for the past four years. *Vermont*: Woodstock, mean temperature 21°.42; mean for February from 1868 to 1882, inclusive, 16°.82; during that period the highest monthly mean, 23°.51 occurred in 1877 and the lowest, 9°.67, occurred in 1875. *Virginia*: Wytheville, mean temperature 41°.97 or 5° above the average of the past 18 years and 1° above the highest monthly mean that occurred during that period. *West Virginia*: Helvetia, mean temperature 40°.6 or 3°.31 above the average of the past 6 years.

Ranges of Temperature at Signal Service Stations.—Monthly ranges in general varied from 40° to 60° over the country east of the Rocky Mountains, and from 45° to 80° westward to the Pacific. The *smallest* ranges are: San Francisco, 23°; Key West, 24°; Port Eads, 31°; Punta Rassa and Sacramento, 32°; Atlantic City, Provincetown, Mass., Olympia and San Diego, 33°; Indianola, Cape May, New Shoreham and Portland, Or., 35°. The *largest* are: Terry's Landing, 96°; Fort Benton, 5°; New Chicago, 90°; Fort Sully, 89°; Smithville, Dak., 88°; Fort Stevenson, 87°; Fort Assinaboine, Rapid City and Fort Keogh, 86°; Bismarck, 84°; Fort Washakie, 82°; Fort Buford, 81°; Fort Shaw, 80°; Rock Creek, 79°; Fort Missoula, 78°; St. Vincent, 77°; Huron and Helena, 75°; Fort Custer, 74°; Eagle Rock and North Platte, 72°; Yankton, 71°. The *daily* ranges varied in the different districts as follows: New England, 24° at Thatcher's Island to 33° at Boston and 37° at Burlington; Middle Atlantic States, 19° at Cape May to 27° at Williamsport and 30° at Sandy Hook, New York and Albany; South Atlantic States, 21° at Smithville to 27° at Charlotte and 33° at Augusta and Kittyhawk; Florida Peninsula, 15° at Key West to 22° at Punta Rassa and Cedar Keys; Eastern Gulf States, 21° at New Orleans to 25° at Vicksburg and 29° at Montgomery; Western Gulf States, 20° at Galveston and Port Eads to 33° at Mason and 36° at Fort Gibson; Rio Grande Valley, 27° at Brownsville to 31° at Uvalde and 38° at Rio Grande; Ohio Valley and Tennessee, 24° at Champaign to 31° at Pittsburg, Morgantown and Cincinnati and 33° at Knoxville; Lower Lake Region, 21° at Detroit and Sandusky to 29° at Rochester and 32° at Cleveland and Oswego; Upper Lake Region, 22° at Alpena to 26° at Milwaukee and 33° at Duluth; Upper Mississippi Valley, 24° at Keokuk to 30° at Des Moines, 32° at St. Paul and 36° at La Crosse; Missouri Valley, 25° at Springfield, Mo., to 31° at Omaha, 35° at Leavenworth and 39° at Yankton; Extreme Northwest, 34° at Moorhead to 36° at St. Vincent, 47° at Fort Stevenson and Bismarck and 48° at Fort Buford; Northern Slope, 37° at Cheyenne to 40° at Fort Keogh, 46° at North Platte and 59° at Fort Benton; Middle Slope, 22° on summit of Pike's Peak to 42° at Dodge City and Fort Elliott and 55° at West Las Animas; Southern Slope, 34° at Coleman City to 38° at Fort Griffin and Jacksboro and 43° at Henrietta and Stockton; Northern Plateau, 26° at Umatilla to 41° at Eagle Rock and 49° at Fort Missoula; Middle Plateau, 22° at Salt Lake City to 32° at Pioche and 40° at Winnemucca; Southern Plateau, 30° at Fort Grant to 41° at La Mesilla, 42° at Fort Verde and Florence and 46° at Prescott; North Pacific Coast Region, 17° at Portland to 21° at Olympia; Middle Pacific Coast Region, 13° at San Francisco to 23° at Sacramento and 29° at Red Bluff; South Pacific Coast Region, 28° at San Diego to 31° at Visalia and Los Angeles, 32° Yuma and 41° at Campo.

Frosts.—In the various districts they were reported on the following dates: New England, 1st to 12th, 14th to 28th; Middle Atlantic States, 1st to 12th, 14th to 20th, 22d to 28th; South Atlantic States, 1st to 3d, 5th to 7th, 22d to 26th; East Gulf States, 1st, 2nd, 5th, 6th, 7th, 10th, 22d, 23d, 24th; West Gulf States, 1st, 2d, 4th, 5th, 6th, 9th, 21st, 22d, 23d; Rio Grande Valley, 1st, 4th, 5th, 21st, 22d; Ohio Valley and Tennessee, 1st to 11th, 14 to 18th, 21st to 28th; Lower Lake Region, 1st to 12th, 14th to 28th; Upper Lake Region, 1st to 28th; Extreme Northwest, 1st to 28th; Upper Mississippi Valley, 1st to 28th; Missouri Valley, 1st to 15th, 21st to 26th;

Table of Comparative Minimum Temperatures for the Month of February.

State or Territory.	Minimum for February, 1882, Signal Service.		Lowest since Signal Service stations were opened—3 to 11 years.			Lowest from any other source.			
	Station.	Temp.	Station.	Temp.	Year.	Place.	Temp.	Year.	Length of Record.
Alabama.....	Montgomery.....	32	Montgomery.....	22	1875	Huntsville.....	-7	1832 & 36	9 years.
Arizona.....	Prescott.....	5	Prescott.....	-11	1880	Fort Canby.....	-12	1855	12 "
Arkansas.....	Little Rock.....	28	Little Rock.....	22	1881	Fort Smith.....	-4	1840	21 "
California.....	Campe.....	17	Campe.....	16	1877	Fort Bidwell.....	-18	1868	19 "
Colorado.....	Pike's Peak.....	-17	Pike's Peak.....	-37	1875	Fort Garland.....	-23		22 "
Do.....	West Las Animas.....	4	Denver.....	-20	1881				
Connecticut.....	New Haven.....	7	New Haven.....	-4	1881	Colebrook.....	-28	1861	9 "
Dakota.....	Fort Stevenson.....	-35	Pembina.....	-48	1876	Fort Abercrombie.....	-40	'61 & '69	15 "
Delaware.....	Delaware Breakwater.....	24	Delaware Breakwater.....	7	1881	Fort Delaware.....	0	1866?	44 "
Dist. of Columbia.....	Washington.....	20	Washington.....	-1.5	1875	Washington.....	-5		49 "
Florida.....	Pensacola.....	37	St. Marks.....	28	1875	Fort Barrancas.....	11	1852?	52 "
Georgia.....	Augusta and Atlanta.....	31	Atlanta.....	21	1881	Augusta Arsenal.....	-2	1835	48 "
Idaho.....	Eagle Rock.....	-29	Eagle Rock.....	-19	1881	Fort Hall.....	-11	1873?	5 "
Illinois.....	Champaign and Chicago.....	11	Chicago.....	-13	1875	Winnebago.....	-26	1864	11 "
Do.....						Fort Armstrong.....	-24	'30 & '35	9 "
Indiana.....	Indianapolis.....	15	Indianapolis.....	-8	1875	Spiceland.....	-21	1866	7 "
Indiana Territory.....	Fort Supply.....	13	Fort Supply.....	-8	1881	Fort Gibson.....	-12	1857?	46 "
Iowa.....	Des Moines.....	1	Dubuque.....	-31	1875	Guttenburg.....	-37	1869	4 "
Kansas.....	Dodge City.....	7	Dodge City.....	-10	1881	Fort Leavenworth.....	-26	1834?	43 "
Kentucky.....	Louisville.....	20	Louisville.....	0	1875	Newport Barracks.....	-20		27 "
Louisiana.....	Shreveport.....	33	Shreveport.....	22	'75 & '81	Fort Jesup.....	7	'23 & '38	23 "
Do.....						Baton Rouge.....	-10	1852?	52 "
Maine.....	Eastport.....	-5	Eastport.....	-20	1876	Brunswick.....	-28	1859?	52 "
Maryland.....	Baltimore.....	23	Baltimore.....	-4	'75 & '81	Fort McHenry.....	-4		43 "
Massachusetts.....	Springfield.....	3	Boston.....	-6	1876	Lunenburg.....	-26	1855	24 "
Do.....			Springfield.....	-6	1880	Williamstown.....	-26	1833?	59 "
Michigan.....	Marquette.....	2	Alpena.....	-27	1881	Ontonagon.....	-37	1861	11 "
Do.....			Marquette.....	-27	1876	Fort Brady.....	-47	1873	51 "
Minnesota.....	St. Vincent.....	-33	Breckenridge.....	-34	'75 & '79	Fort Ripley.....	-43	1860	14 "
Do.....			Duluth.....	-34	1875				
Mississippi.....	Vicksburg.....	32	Vicksburg.....	21	1875	Columbus.....	14		10 "
Missouri.....	Springfield.....	13	St. Louis.....	-3	1875	St. Louis.....	-25	1835	37 "
Do.....						Jefferson Barracks.....	-18	1835	35 "
Montana.....	Terry's Landing.....	-37	Fort Custer.....	-29	1881	Fort Ellis.....	-53	1872	6 "
Nebraska.....	North Platte.....	-4	North Platte.....	-23	1881	Fort McPherson.....	-24	1874	8 "
Do.....			Pioche.....	-5	1879	Fort Kearney.....	-22	1852?	19 "
Nevada.....	Winnemucca.....	-17	Winnemucca.....	-5	1880	Fort Ruby.....	-19	1864?	5 "
Do.....			Mount Washington.....	-42	1876				
New Hampshire.....	Mount Washington.....	-21				Stratford.....	-37	1861	11 "
Do.....						Dartmouth College.....	-33	1848?	18 "
New Jersey.....	Barnegat.....	-18	Atlantic City.....	-5	1875	Newark.....	-7	1861	10 "
Do.....			Squan Beach.....	-5	1875				
New Mexico.....	Santa Fe.....	11	Santa Fe.....	-3	'75 & '80	Fort Union.....	-7		23 "
New York.....	Albany.....	7	Albany.....	-16	1875	Sackett's Harbor.....	-46	1861	8 "
Do.....						Belleville.....	-34	1835	15 "
North Carolina.....	Smithville.....	24	Kittysaw.....	11	1881	Fort Johnson.....	3	1835	54 "
Ohio.....	Cleveland.....	17	Toledo.....	-12	1875	Hillsborough.....	-22	1835	35 "
Do.....						Marietta.....	-18	1852?	53 "
Oregon.....	Umatilla.....	4	Umatilla.....	6	1881	Camp Harney.....	-16	1868	6 "
Pennsylvania.....	Philadelphia.....	18	Erie.....	-10	1875	Lewisburg.....	-23	'65 & '67	6 "
Do.....						Philadelphia.....	-2	1866	113 "
Rhode Island.....	Newport.....	10	Newport.....	-2	1881	Providence.....	-16	1866	35 "
South Carolina.....	Charleston.....	33	Charleston.....	20	1881	Fort Moultrie.....	6	1835	38 "
Tennessee.....	Nashville.....	26	Knoxville.....	6	1875	Glenwood Cottage.....	-4	1864?	11 "
Texas.....	Fort Elliott.....	13	Fort Elliott.....	-1	1881	Fort McKavett.....	3	1873?	22 "
Utah.....	Salt Lake City.....	4	Salt Lake City.....	3	1880	Fort Crittenden.....	-6		3 "
Vermont.....	Burlington.....	-6	Burlington.....	-18	1881	Randolph.....	-31	1868	5 "
Virginia.....	Fort Myer.....	19	Fort Whipple.....	-1	1881	Al-xaudria.....	3	1855	11 "
Washington Ty.....	Spokane Falls.....	-14	Spokane Falls.....	-7	1881	Fort Colville.....	-20	1862?	14 "
West Virginia.....	Morgantown.....	21	Morgantown.....	-10	1875				
Wisconsin.....	La Crosse.....	3	La Crosse.....	-34	1875	Fort Howard.....	-38	1823	30 "
Do.....						Superior City.....	-38	1863	3 "
Wyoming.....	Fort Washakie.....	-26	Cheyenne.....	-12	1881	Fort Fetterman.....	-40	1873	6 "
Do.....						Fort Laramie.....	-33	1864?	25 "

Northern Slope, 1st to 28th; Middle Slope, 1st to 9th, 12th, 14th to 17th, 19th, 21st to 27th; Southern Slope, 9th, 20th to 23d; Southern Plateau, 1st to 28th; Middle Plateau, 1st to 5th, 7th, 8th, 12th, 15th, 17th to 25th, 28th; Northern Plateau, 1st to 7th, 9th to 13th, 15th to 23d; North Pacific Coast Region, 1st, 2d, 3rd, 6th, 7th, 10th, 11th, 13th, 16th to 24th; Middle Pacific Coast Region, 2d, 3d, 4th, 7th, 8th, 10th, 11th, 13th, 14th, 15th, 17th to 23d; Southern Pacific Coast Region, 2d to 5th, 7th, 8th, 9th, 12th to 15th, 18th to 25th, 28th.

Ice.—Regarding its formation in the northern sections, this subject is considered elsewhere in the REVIEW under the head of *Ice in Rivers and Harbors*. The following are exceptional cases of its formation in the southern sections of the country: Princeton, Cal., 19th, $\frac{3}{4}$ inch thick; Fayette, Miss., 1st; Stateburg, S. C., 25th; Ashwood, Tenn., 22d to 25th; Charleston, S. C., 25th, one inch thick in some parts of the city; New River Inlet, N. C., 1st; Denison, Tex., 21st and 22d, on shallow pools; Little Rock, 21st; Memphis, 21st, 22d; Ft. Supply, Ind. Ty., 19th; 21st, $\frac{3}{4}$ inch thick on river; Ft. Elliott, Tex., 20th.

Low Temperatures.—Winnemucca, Nev., 18th, minimum temperature -17° , the lowest ever experienced at this place. The

following notable instances of extremely low temperatures were received too late to be published in the January REVIEW: Parker's Station, Burnt River, Or., January 29th, minimum temperature -26° ; lowest for many years. Canyon, City, Or., January 29th, minimum temperature -4° .

PRECIPITATION.

The general distribution of rain-fall over the United States and Canada for the month of February, 1882, is exhibited upon chart No. III from the reports of over 500 stations. From the table in the left hand corner of the chart is obtained a monthly average for each of the various districts, determined from the records of Signal Service stations, covering a period of several years, to which is subjoined a comparison of the present month with such averages. Upon comparison with the chart the tabulated averages show three areas of deficiency, and one large and irregular area of excess. The latter extends southwestward from the Canadian Maritime Provinces to central Texas, and thence directly west to the Pacific coast, the departures ranging from 0.25 inch in the South Pacific Coast Region to 3.16 inches in Tennessee, and 3.74 inches in the Ohio Valley. Within the central portion of this large area rains were continuous and excessive during the

month, resulting in heavy freshets and an enormous destruction of property, the details of which will appear elsewhere in the REVIEW under the head of *Floods*. Of the areas of deficiency, one embraces the South Atlantic States and Florida Peninsula, departures ranging from 0.57 inch in the former to 2.09 inches in the latter. The second area is found in the Rio Grande Valley, departure 0.21 inch. The third comprises the Extreme Northwest, Missouri Valley, Middle Slope, Middle Plateau, Middle Pacific Coast Region and the remaining districts to the north and west, departures ranging from 0.19 inch in the Extreme Northwest to 1.98 inches in the Middle Pacific Coast Region. As a means of interesting comparison, the following maximum departures from the normal are given for each year since 1873, together with the corresponding districts: 1874, very large excess, South Atlantic States and excess, Ohio Valley and Tennessee; 1875, —2.08 inches Pacific Coast Regions, and +2.00 inches Western Gulf States; 1876, +2.30 inches Upper Lake Region and +1.75 inches Middle Atlantic States; 1877, —2.90 inches Ohio Valley and Tennessee, —2.50 inches Eastern Gulf States and —2.35 inches Lower Lake Region; 1878, +6.12 inches California coast, +5.27 inches, Portland Or., and —2.18 inches Tennessee; 1879, Portland, Or., +5.62 inches, —1.60 inches Western Gulf States, and 1.30 inches Middle States; 1880, +4.54 inches Tennessee, +2.47 inches St. Lawrence Valley and —2.51 inches Portland, Or.; 1881, +4.43 inches North Pacific Coast Region +3.09 inches Upper Lake Region and +2.83 inches Eastern Gulf States and Lower Missouri Valley.

Deviations from Average Precipitation.—Under this heading departures exhibited by the reports from regular Signal Service stations are shown in the table of comparative monthly rain-falls, as published in the lower left-hand corner of chart No. III. The following items of importance are reported by Voluntary Observers: *Illinois*: Riley, total precipitation for month 2.15 inches or 0.71 inch more than the average of the past 19 years. Larger monthly precipitations occurred in 1861, 1869, 1876 and 1881. Total precipitation for winter of 1881-2 was 6.41 inches or 1.21 inches more than the average of the past 18 years. Only the winters of 1866-7, 1873-4, 1875-6, 1879-80 and 1880-1 had larger precipitations. *Indiana*: Vevay, total precipitation for the month 6.70 inches or 3.77 inches above the average of the past 17 years. *Iowa*: Clinton, monthly rain-fall below the average. *Kansas*: Manhattan, monthly precipitation 0.42 inch or 0.53 inch below the average of the past 22 years. Wellington, monthly precipitation 1.18 inches or 0.63 inch above the average of the past 3 years. Lawrence, monthly precipitation 1.66 inches or 0.43 inch above the February average of the past 14 years; during that period the largest monthly precipitation, 4.60 inches, occurred in 1881; the smallest, 0.03 inch, occurred in 1870. Yates Centre, monthly precipitation 2.89 inches or 0.74 inch above the average of past 2 years. *Maine*: Gardiner, monthly precipitation 4.96 inches or 1.67 inches above the average of the past 46 years. *Maryland*: Fallston, monthly precipitation 4.79 inches or about 1.50 inches above the average of the past 11 years. *Missouri*: St. Louis, Missouri Weather Service reports: monthly precipitation 7.34 inches, which has been exceeded only once since 1839, viz: in 1854, when the amount was 7.74 inches. *New Hampshire*: Contoocookville, monthly snowfall, 37 inches which is larger than for any winter month during the past 12 years, with the exception of December, 1876, when 42 inches fell. *New York*: North Volney, monthly precipitation 2.70 inches or 0.02 inch above the average of the past 9 years; during that period the largest monthly precipitation, 4.70 inches, occurred in 1876 and the smallest, 0.30 inch, occurred in 1877. The total precipitation for winter of 1881-2; was 11.20 inches average for 9 previous winters, 9.12 inches; largest, 13.95 inches, occurred in 1879; smallest, 5.95 inches, occurred in 1877. Palermo, monthly precipitation 2.50 inches or 0.30 inch below the average of February for the past 29 years; largest during that period, 7.20 inches, occurred in 1866; smallest 0.10 inch, occurred in 1877. *Ohio*: Cleveland, monthly precipitation, 3.14 inches or 0.88 inch above the aver-

age of the past 27 years; during that period the largest monthly precipitation 4.90 inches occurred in 1876 and the smallest 0.25 inch, occurred in 1877. *Texas*: Clarksville, monthly rain-fall greater than the average of the corresponding month for past 12 years. *Virginia*: Wytheville, monthly precipitation 5.09 inches or 1.60 inches above the average of past 18 years. *West Virginia*: Helvetia, monthly precipitation 6.95 inches or an excess of 3.77 inches above the average of past 6 years.

Special Heavy Rains.—2d and 3d, New Ulm, Tex., 3.00 inches; Ft. Barrancas, Fla., 3.92. 3d, Vicksburg, 2.62; Shreveport, 2.97. 4th, Kittyhawk, N. C., 2.59; Barnegat, N. J., 3.50. 7th, Protom, Mo., 1.44 in 7 hours. 7th and 8th, Mt. Ida, Ark., 4.75. 8th, Little Rock, 3.33, Montgomery, 3.01; Auburn, Ala., 3.56, in 14 hours; Decatur, Tex., 2.73. 9th, Mayport, Fla., 1.00, in 45 minutes. 16th, Protom, Mo., 2.00, from daylight to 9 a. m. 18th and 19th, College Hill, Ohio, 3.00. 19th, St. Louis, 3.96. 19th and 20th, Swanwick, Ill., 3.60; New Harmony, Ind., 4.30; Springfield, Ill., 2.69; Jefferson Barracks, Mo., 5.12. 20th, Indianapolis, 3.02; Louisville, 2.97; Springfield, Ill., 3.28; Bethel, Ohio, 2.50; Ft. Scott, Kan., 2.75, in 23 hours; Protom, Mo., 1.49, in 5 hours; St. Louis, 2.75. 27th and 28th, Highlands, N. C., 4.00; Eola, Or., 3.30. 28th, Little Rock, 2.57; Atlanta, 2.78; Auburn, Ala., 2.33, in 9 hours; Protom, Mo., 1.34 in 3 hours. On the 19th, 20th and 21st, St. Meinrad, Ind., 4.50; Curryville, Mo., 8.07.

Largest Monthly Rain-falls, including Melted Snow.—Fort Stevens, Or., 13.27 inches; Little Rock, Ark., 12.74; Auburn, Ala., 11.31; Highlands, N. C., 11.00; New Ulm, Tex., 10.94; Mt. Ida, Ark., 10.80; Portland, Or., 10.49; Fort Canby, Wash. Ty., 10.48; Fort Gaston, Cal., 10.46; Atlanta, Ga., 10.29; Memphis, 9.92; New Shoreham, R. I., 9.73; Louisville, 9.69; Olympia, Wash. Ty., 9.60; College Hill, Ohio, 9.50; Montgomery, Ala., 9.27; St. Meinrad, Ind., 9.20; Fort Barrancas, Fla., 9.16; Laconia, Ind., 9.13; Eola, Or., 9.06; Protom, Mo., 8.98; St. Louis, 8.94; Barnegat, N. J., 8.91; Shreveport, 8.71; Nashville, 8.58; New Harmony, Ind., 8.56; Clarksville, Tex., 8.25; Anna, Ill., 8.17; Chamois, Mo., 8.08; Charleston, Ill., and St. Charles, Mo., 8.01; Rolla, Mo., 8.00; Austin, Tenn., 7.95; Springfield, Ill., 7.92; Forsyth, Ga., 7.90; Wellsboro, Pa., 7.86; White Plains, N. Y., 7.80; Princeton, Mass., 7.78; Murfreesboro, Tenn., 7.62; Murphy, N. C., 7.40; Westborough, Mass., 7.32; Ashwood, Tenn., 7.30; San Geronio, Cal., and Springfield, Mo., 7.29; Indianapolis, 7.28; Chattanooga, Tenn., 7.24; Swanwick Ill., 7.17; Vicksburg, 7.15; Cincinnati, 7.04; Bethel, Ohio, 7.00; Jefferson Barracks, Mo., 6.96; Helvetia, W. Va., 6.95; Vevay, Ind., 6.70; New Corydon, Ind., 6.68; Mascoutah, Ill., 6.54; Spiceland, Ind., 6.53; Big Creek and Centerville, Mo., 6.46; Charlottetown, P. E. I., 6.37; Jacksonburg, Ohio, 6.25; Dayton, Wash. Ty., 6.16; Northport, Mich., 6.15; Bowling Green, Ky., 6.11; Knoxville, Tenn., 6.10; South Lee, Mass., 6.00.

Smallest Monthly Rain-falls, including Melted Snow.—Browns, Hot Springs, Reno, and Tecoma, Nev., Indio and Mammoth Tank, Cal., Casa Grande, Maricopa, and Texas Hill, Ariz., none; Ft. Meade, Dak., and Yuma, Ariz., 0.01 inch; Duluth, Minn., Ft. Custer, Mont., St. Augustine, Fla., and West Las Animas, Col., 0.02; Smithville, Dak., 0.03; Cheyenne, Wyo., and Wadsworth, Nev., 0.05; Santa Fe, N. M., 0.06; Ft. Sully and Yankton, Dak., 0.09; Forts Lincoln and Yates, Dak., and Camp Near Presido, Tex., 0.10; Rio Grande City, Tex., 0.11; Ft. Washakie, Wyo., and Terry's Landing, Mont., 0.12; North Platte, Neb., 0.13; Foley, Mont., 0.14; Ft. Elliott, Tex., 0.16; Ft. Bridger, Wyo., and Ft. Keogh, Mont., 0.18; Rapid City, Dak., 0.19; Denver, Ft. McDermitt, Nev., and Punta Rasa, Fla., 0.20; Deadwood, Dak., 0.21; Dodge City, Kan., and Ft. Garland, Col., 0.22; Ft. Shaw, Mont., 0.23; Ft. Assinaboine, Mont., 0.24; Fremont and Inavale, Neb., and Huron, Dak., 0.25; Ft. Snelling, Minn., 0.28; Ft. Buford, Dak., 0.29; Bismarek and Ft. Totten, Dak., 0.30; Lordsburgh, N. M., and Superior City, Neb., 0.35; Pike's Peak, 0.36; Helena, Mont., and Pioche, Nev., 0.37; Ft. Benton, Mont., 0.38; Avon, Neb.,

and Key West, Fla., 0.40; Manhattan, Kan., and Salt Lake City, 0.42; Ft. Hale Dak., and White Water, Cal., 0.48; Elko and Toano, Nev., New Chicago, Mont., Stockham, Pawnee and Weeping Water, Neb., and Tracy, Cal., 0.50.

Rainy Days.—The number varied in New England from 12 to 21; Middle Atlantic States, 10 to 18; South Atlantic States, 4 to 13; Florida Peninsula, 3 to 10; East Gulf States, 11 to 14; West Gulf States, 7 to 16; Rio Grande Valley, 3 to 10; Ohio Valley and Tennessee, 10 to 17; Lower Lake Region, 12 to 19; Upper Lake Region, 9 to 20; Extreme Northwest, 5 to 11; Upper Mississippi Valley, 5 to 14; Missouri Valley, 4 to 14; Northern Slope, 3 to 8; Middle Slope, 2 to 7; Southern Slope, 3 to 9; Southern Plateau, 6 to 11; Middle Plateau, 7 to 10; Northern Plateau, 6 to 17; North Pacific Coast Region, 20 to 24; Middle Pacific Coast Region, 10 to 12; South Pacific Coast Region, 2 to 10.

Cloudy Days.—The number varied in New England from 5 to 17; Middle Atlantic States, 6 to 13; South Atlantic States, 5 to 16; Florida Peninsula, 0 to 2; East Gulf States, 6 to 12; West Gulf States, 2 to 15; Rio Grande Valley, 4 to 16; Ohio Valley and Tennessee, 10 to 15; Lower Lake Region, 8 to 15; Upper Lake Region, 9 to 17; Extreme Northwest, 2 to 9; Upper Mississippi Valley, 4 to 9; Missouri Valley, 4 to 12; Northern Slope, 0 to 7; Middle Slope, 1 to 3; Southern Slope, 5 to 13; Southern Plateau, 2 to 5; Middle Plateau, 5 to 9; Northern Plateau, 10 to 16; North Pacific Coast Region, 15 to 17; Middle Pacific Coast Region, 6 to 9; South Pacific Coast Region, 2 to 6.

Snow.—The dates on which snow fell in the various districts are as follows: New England, 1st to 13th, 17th to 24th, 26th, 27th; Middle Atlantic States, 1st to 6th, 10th, 12th, 19th to 24th; South Atlantic States, 4th, 5th; Tennessee, 4th, 21st; Ohio Valley, 2nd, 4th, 5th, 21st to 24th; Lower Lake Region, 1st to 5th, 7th, 10th, 17th to 24th; Upper Lake Region, 1st to 7th, 9th, 11th, 14th, 16th to 26th; Extreme Northwest, 1st, 3rd, 6th, 9th, 12th, 14th to 19th, 22nd; Upper Mississippi Valley, 4th, 5th, 17th to 21st; Missouri Valley, 2nd, 16th to 21st, 23rd, 24th; Northern Slope, 3rd, 5th to 8th, 10th to 21st, 23rd, 26th to 28th; Middle Slope, 1st, 6th, 7th, 11th, 12th, 17th to 22nd, 26th, 27th; Southern Slope, 2nd, 3rd, 8th, 19th, 20th; Southern Plateau, 1st, 2nd, 6th, 7th 11th, 16th, 18th to 20th, 26th, 27th; Middle Plateau, 1st, 5th to 7th, 9th to 12th, 15th to 17th, 20th, 21st, 26th 27th; Northern Plateau, 5th, 7th to 9th, 11th, 12th, 13th, 15th, 16th, 17th, 20th to 27th; North Pacific Coast Region, 7th to 14th, 16th, 17th, 19th, 20th, 23rd, 25th, 26th, 27th; Middle Pacific Coast Region, 10th, 11th, 12th, 17th, 18th; South Pacific Coast Region, 1st, 6th, 16th to 20th. Particularly heavy or remarkable snow falls were reported as follows: Contoocookville, N. H., 5th, snow fell to a depth of 20 inches and drifted badly. Newport, R. I., 5th, snow one foot deep on a level and drifted to depths of from 2 to 10 feet. Eastport, Me., the storm of the 5th was one of the severest that has visited this section for years. It was accompanied by a heavy blinding snow which drifted badly, making travel through the country very difficult for several days. Dubuque, Iowa, 20th and 21st, heavy snow storm; trains delayed; telegraphic communication interrupted. The Illinois Central Railroad Company ran their snow plows for the first time this season. La Crosse, 20th, heavy snow storm set in at 11 a. m. and continued throughout the day; the snow being light drifted badly, causing delay of trains. 21st, storm ended about 1.30 p. m.; depth of snow about 16 inches. St. Paul, 21st, snow storm ended at 12.50 p. m., nearly 2 feet having fallen during 20th and 21st, which is badly drifted. All trains delayed on account of snow blockades, which are reported as being very numerous in the southern part of State. Fort Washakie, Wyo., 20th heavy snow in mountains; stage abandoned; mails brought in on horseback. Prescott, Ariz., 20th, snow reported to be 6 feet deep on the mountains. Eagle Rock, Idaho, 17th, 7.50 a. m. to 3 p. m., one of the severest snow storms of the season; trains on the Utah Northern Railroad delayed by blockades. 22nd, mails still delayed

on account of snow blockades. Salinas City, Cal., 17th, snow fell to a depth of $\frac{1}{2}$ inch, "which is more than has ever before been known to fall at this place." Springfield, Mass., 1st, heaviest storm since 1854, snow 22 inches on the level. Heavy storms in former years occurred as follows: January, 1857, 17 inches; January, 1867, 17 inches; December, 1869, 12 inches; February, 1873, 12 $\frac{1}{2}$ inches. The great snow storm of January, 1867, impeded travel to a much greater extent than did the present storm, but the depth of snow was considerably less, the trouble at that time being the drifting by the heavy wind which accompanied the storm. Stockbridge, Mass., 1st, snow 22 inches on the level; heaviest storm for past 30 years. Carbondale, Pa., 4th, heaviest storm for years; snow 36 inches on the level. Lewes, Del., 4th, most violent snow storm for years; wind attained an estimated velocity of 70 miles per hour. Along both the Middle Atlantic and New England coasts this storm proved to be the heaviest and most destructive for years. Many marine disasters occurred and immense drifts formed, which blockaded all railroad traffic for several days. Port Jervis, N. Y., 1st, snow fell to the depth of 14 inches. Poughkeepsie, N. Y., 1st, snow fell to the depth of 12 inches, and at several points on Long Island, to a depth of 16 inches. Boston, 1st, snow 18 inches on the level; one of the heaviest storms for many years. Long Branch, N. J., 4th, most violent snow storm on these shores for many years. Snow on the ground from 6 inches to 6 feet deep. Drifts in many places rendered travel impossible. All trains delayed. Easton, Pa., 4th, severest storm of the season; railway trains delayed in all directions. Poughkeepsie, N. Y., 4th, storm commenced at 11 a. m. and raged with great fury until 7.30 a. m. of the 5th. Travel of all kinds suspended. Freeport, Long Island, 4th, ten inches fell during the day; storm still raging. Baltimore, 4th, snow 12 to 14 inches on the level and in many places drifted from 4 to 6 feet deep. Gloucester, Mass., 1st, snow 18 inches on the level; in many places drifted to a depth of 12 feet and in the main streets from 6 to 8 feet on the north side. Schools closed throughout the city and business generally suspended. Plymouth, Mass., 1st, severest storm for many years. Lebanon, N. H., 22d, 14 inches on the level; heaviest storm of the season. Derby Line, Vt., 22d, 10 to 15 inches on the level. Hanover, N. H., 22d, 12 inches on the level; heaviest fall of the season. Montreal, Can., 22d, streets blockaded with 4 feet of snow; all travel seriously obstructed. Philadelphia, 4th, all traffic much impeded; snow 10 to 15 inches on the level. Reports from various parts of the State show that the storm was most violent in the mountains west of Harrisburg. At many places the snow fell to a depth of three feet. At Williamsport, Sunbury, Reading and Pottsville, and in the northern part of the State the storm proved to be very violent. South Framingham, Mass., 1st, in Worcester, Middlesex and Norfolk counties, highways blockaded; railway trains all delayed. Snow over 20 inches deep on the level. Lowell, Mass., 1st, snow 18 inches on the level. Narrowsburg, N. Y., 1st, snow two feet deep. Monticello, N. Y., 1st, snow 20 inches on the level. Concord, N. H., 11th, snow fell to the depth of 10 inches on the level, making a total of 70 inches since the 1st, "a greater amount than that which has fallen in the whole month of February for the past 20 years." St. John, N. B., 10th, heavy snow storm accompanied by violent winds from the northeast. All trains on the St. John and Maine R. R. blockaded and "tremendous drifts" formed on the Inter-colonial R. R. The carshed of the latter railway company was demolished by the heavy weight of snow; loss estimated at \$75,000. Port Jervis, N. Y., 4th, snow 10 to 15 inches on the level and drifted badly; travel seriously impeded. Fredericksburg, Va., 4th, heavy northeast storm for past 15 hours; snow 12 inches deep on the level. Trains delayed and all communication on wagon roads cut off. Petersburg, Va., 4th, violent snow storm, extending south to Weldon, N. C., and westward beyond Lynchburg. At points along the Norfolk and Western R. R., snow 10 to

15 inches deep. Washington, D. C., 4th, snow fell to the depth of from 12 to 14 inches on the level. Street car travel seriously obstructed.

Largest Monthly Snow-falls.—Emigrant Gap, Cal., 94 inches; Summit, Cal., 90; Cisco, Cal., 85; Mt. Washington, 54.50; Truckee, Nev., 49.50; Alta, Cal., 49; Princeton, Mass., 44; Westborough, Mass., 42.50; Dayton, Wash. T., 42.40; Newport, Vt., 39.55; Antrim, N. H., 38.50; Contoocookville, N. H., 37; New Market, N. H., 36.60; Lunenburg, Vt., 36.50; Boca, Nev., 36; Boston, and Grafton, N. H., 34; Woodstock, Vt., 30.75; Eastport, 31.40; Dexter, Me., 30.50; Worcester, Mass., 30.25; Rowe and South Lee, Mass., 30; Marquette, Mich., about 30; Colfax, Cal., and White Plains, N. Y., 29; New Bedford, Mass., about 27; Strafford, Vt., 26; New Shoreham, R. I., 25.30; Rochester, 24.60; Corinne, Utah and Deer Park, Md., 24; Somerset, Mass., and Ft. Myer, Va., 23.30; St. Paul, 22.60; Ashland, Wis., 22; San Geronio, Cal., 21.50; Amherst, Mass., 20; Northfield, Minn., 19.90; Dyberry, Pa., 19.50; Berryvale, Cal., and Helvetia, W. Va., 19; Kelton, Utah, and Port Jervis, N. Y., 18; New London, Conn., about 18; Charlotte, Vt., and Northport, Mich., 17; Escanaba, Mich., and Keene, Cal., 16; Prescott, Ariz., about 16; Fall River, Mass., 15.50; Newport, R. I., and Tehachapi, Cal., 15; Winnemucca, Nev., about 15; Johnstown, N. Y., 14.70; Freehold, N. J., 14.50; Washington, D. C., 14.20; Otega, Nev., 13.75; Catawissa, Pa., 13.40; Palermo, N. Y., and Southington, Conn., 13; Eagle Rock, Idaho, 12.70; Grand Haven, 12.60; South Orange, N. J., 12.25; Atlantic City, 12.10; Acotink and Wytheville, Va., Vineland, N. J., Chambersburg, Pa., and Carson City, Nev., 12; Port Huron, 11.90; Ogden, Utah, 11.88; Waterburg, N. Y., and Promontory, Utah, 11.50; Duluth, Minn., 10.80; Lynchburg, Va., 10.70; Ardenia, N. Y., 10.50; Pagosa Springs, Col., Halleck, Nev., Flushing, N. Y., Logan, Ia., Fallston, Md., Princeton, N. J., and Franklin, Wis., 10; New York City, about 10; Wells, Nev., 9.75; Manitowoc, Wis., and West Chester, Pa., 9; Sandusky, 8.80; Terrace, Utah, Moorestown, N. J., and Friendship, N. Y., 8.50; St. Vincent, Minn., 8.30; Fallsington, Pa., Lincoln, Neb., Cooperstown, N. Y., Coalville, Utah, and Moorhead, Minn., 8; Ft. Missoula, Mont., about 8; Ithaca, N. Y., Somerville, N. J., and New Athens, Ohio, 7.50; Albany, N. Y., and Neillsville, Wis., 7.30; Battle Mountain and Palisade, Nev., Red Bluff, Cal., Williamsport, Pa., and Phillipsburg, N. J., 7.

Depth of Snow on Ground at end of Month.—Colorado: Pike's Peak, about 6 inches. Connecticut: Southington, remains of drifts; New London, trace. Idaho: Eagle Rock, 3½ inches. Iowa: Ames, 4½ inches. Maine: Gardiner, 30 inches, Orono, 10 inches, Eastport, 7 inches. Massachusetts: Somerset, trace; Rowe, 29 inches; Amherst, patches in scattering places; Worcester, ground bare in many places; Springfield, 6 inches; Boston, 3 inches; Provincetown, 1 inch. Michigan: Northport, ½ inch; Marquette, 12 inches; Escanaba, 0 to ½ inch. Minnesota: Northfield, Moorhead and St. Paul, trace; Duluth, 4 inches; St. Vincent, 11 inches. Montana: Ft. Missoula, 4 inches; Helena, 1 inch; Nevada: Pioche, 4 inches. New Hampshire: Grafton, 16 inches; Mt. Washington, 29 inches; New Market, 13 inches. New Mexico: Santa Fe, trace to 3 inches. New York: Albany, 2 inches; Cooperstown, 4 inches; Ithaca, Oswego and Palermo, trace; Johnson, 4 inches. Pennsylvania: Catawissa, trace on hills; Dyberry, 6 inches. Rhode Island: Newport, none in open country, but in sheltered places small quantities remain from the heavy storm that occurred on the 4th and 5th. Utah: Salt Lake City, trace. Vermont: Burlington and Strafford, 6 inches; Charlotte, 4 to 8 inches; Newport, about 10 inches; Woodstock, 13 inches.

Rain, Hail or Snow from a Cloudless Sky.—Burlington, Vt., 1st, light snow at intervals during the day and night; 2d, 5th, 6th, 13th, 22d, 23d.

Hail.—Mobile, Ala., 23th, 11.30 a. m., lasting one minute; hailstones ½ inch in diameter. Mason, Tex., 27th, 7.50 p. m., last-

ing ten minutes; hailstones as large as pigeon's eggs. Fort Cummings, N. M., 27th, light hail. Camp Grant, Ariz., 19th, 10.30 to 11.30 a. m. San Francisco, 11th, 4.55 to 4.57 p. m.; 16th, 4.15 p. m. Los Angeles, Cal., 19th, 3 p. m., hail fell near the foot hills, 5 miles north and in Sierra Madre Mountains, 13 miles north of station. Visalia, Cal., 17th. San Diego, Cal., 1st, 7.22 to 7.25 p. m., hailstones were soft and about the size of peas; 17th, 12.20 p. m., small hail. Pt. San Jose, Cal., 15th. Presidio, Cal., 11th, 6.30 a. m. Fort Stevens, Or., 5th. Fort Townsend, Wash. Ty., 10th. Paterson, N. J., 21st, 5.45 p. m., heavy fall of hail lasting 10 minutes. Ardenia, N. Y., 21st. Clarksville, Tex., 27th, hailstones one inch in diameter.

Sleet.—The dates on which sleet fell in the various districts are given as follows: New England, 9th, 10th, 12th, 20th, 21st, 23d; Middle Atlantic States, 4th, 5th, 19th, 21st; Ohio Valley, Cincinnati, 21st; Upper Mississippi Valley, 2d, 17th to 21st; Missouri Valley, 17th to 22d; Southern Slope, 7th, 8th, 19th, 20th; Southern Plateau, La Mesilla, 2d, Ft. Verde and Camp Grant, Ariz., 19th; Northern Slope, Ft. Washakie, Wyo., 16th; Northern Plateau, Umatilla, Or., 22d; North Pacific Coast Region, 12th, 16th, 20th; South Pacific Coast Region, Visalia, Cal., 17th. Unusually severe sleet storms have been reported, as follows: Toledo, throughout the night of 20th and during the 21st a storm of rain, sleet and snow raged with great violence; telegraph poles were prostrated and great damage done to fruit and shade trees. Telegraph lines were down in every direction; all communication cut off. The principal cause of destruction to property was the heavy sleet, which prevailed over an area of country within a radius of 20 miles about Toledo. Damage estimated at over \$5,000. Port Huron, Mich., 21st, everything covered with a thick coating of ice. A telegraph pole, supporting 30 wires, was broken down under its weight. Ft. Madison, Iowa, storm commenced on 19th and continued during 20th and 21st; rain froze as it fell; ground was covered with a sheet of ice; trees were weighed down with ice, and many limbs broken off. Ft. Scott, Kan., 20th to 24th; trees heavily loaded with ice; much damage done. Yates Centre, Kan., 19th and 20th, all exposed objects covered with ice ½ inch in thickness; storm the severest of the kind that has been experienced here for 3 years; sleet covered the ground to a depth of 4 inches. Warrenton, Mo., 20th, trees covered with ice; many evergreens broken down. Dyberry, Pa., 21st, trees on the hills loaded with ice an inch thick; thousands of limbs were broken off and many whole trees fell. All trees looked like weeping-willows under the weight of ice. Embarrass, Wis., 20th, ground covered with a sheet of ice. Keokuk, 19th, 20th, rain freezing as it fell, weighing down telegraph wires, trees, etc. Rochester 20th, very violent storm began in the early evening, accompanied by high wind velocities from the south and southwest. The damage alone to window-glass and sky-lights reached thousands of dollars. Shade trees and telegraph and telephone wires were badly damaged.

Drought.—Deadwood, Dak., 27th, the small precipitation of past two months has caused great complaint as to scarcity of water in this city and in the rural districts.

RELATIVE HUMIDITY.

The percentage of mean relative humidity for the month ranges as follows: New England, from 71 to 81; Middle Atlantic States, 61 to 82; South Atlantic States, 65 to 79; Florida Peninsula, 71 to 73; East Gulf States, 69 to 78; West Gulf States, 64 to 83; Rio Grande Valley, 67 to 81; Ohio Valley and Tennessee, 67 to 72; Lower Lake Region, 70 to 79; Upper Lake Region, 72 to 82; Extreme Northwest, 61 to 88; Upper Mississippi Valley, 61 to 74; Missouri Valley, 62 to 74; Northern Slope, 54 to 69; Middle Slope, 52 to 60; Southern Slope, 61 to 82; Southern Plateau, 55 to 70; Middle Plateau, 50 to 71; Northern Plateau, 61 to 85; North Pacific Coast Region, Olympia, 82.8, Portland, 82.5; Middle Pacific Coast Region, 69 to 75; South Pacific Coast Region, 46 to 70. High stations report the following percentages not corrected for altitude:

Santa Fe, 52.9; Denver, 47.8; Pike's Peak, 73.0; Mt. Washington, 81.3.

WINDS.

The prevailing winds during the month of February, 1882, at Signal Service stations are shown on chart No. II, by arrows which fly with the wind. Along the Middle Atlantic and New England coasts they are *northwesterly*. In the South Atlantic States, *southwesterly*. Between the meridians of 80° and 100° W., and from the Gulf northward to Lake Superior, *southerly*. In the Northern Plateau, Northern and Middle Slopes, *southwest to northwest*. In the Middle and Southern Plateaux, *variable*. In the North Pacific Coast Region, *southerly*. In the Middle and Southern Pacific Coast Regions, *variable*.

High Winds.—The following are the highest velocities attained on the summit of Mt. Washington, with direction at time of occurrence on the respective dates: 120 miles NW., 8th; 116, NW., 13th; 110, NW., 18th; 106, NW., 17th; 90, SW., 28th; 89, NW., 14th; 86, NW., 3d, and W., 19th; 85, NW., 6th and 10th; 84, NW., 16th; 82, NW., 11th; 80, NW., 4th and 15th; 76, NW., 20th; 75, NW., 12th. On all other dates during the month velocities reached or exceeded 50 miles per hour, with the exception of 23d, 24th and 25th. On summit of Pike's Peak the highest velocities reported are: 60, NW., 3d; 58, SW., 11th; 54, NW., 4th, W., 13th and SW., 18th; 52, SW., 17th, NE., 20th and NW., 28th; 50, W., 5th. Other stations reporting velocities of 50 miles per hour or over are as follows: Ft. Shaw, Mont., 62, SW., 14th. Stockton, Tex., 52, NW., 7th. Indianola, 56, SW., 28th; 51, N., 3d. Buffalo, 56, SW., 22d. Rochester, 56, S., 28th. Champaign, Ill., 51, SW., 21st. Eastport, 60, NE., 22d. New Shoreham, R. I., 64, NE., 5th; 60, NE., 4th. Sandy Hook, N. J., 56, NE 5th; 54, NE., 4th. Barnegat, N. J., 56, N.; 5th, 50, NE., 21st. Cape May, N. J., 60, NW., 4th; 50, NW., 5th. Delaware Breakwater, 56, NE., 4th; 51, NW., 5th; 50, SW., 13th. Cape Henry, Va., 52, NE., 4th. Hatteras, N. C., 64, SW., 21st; 60, SW., 4th. Portsmouth, N. C., 52, SW., 4th and 21st. Umatilla, Or., 56, N., 16th. Thatcher's Island, Mass., 58, NE., 5th; 56, E., 22d.

Total Movements of the Air.—The following are the largest total movements at Signal Service stations: Mt. Washington, 27,334 miles; Pike's Peak, 14,257; Thatcher's Island, Mass., 12,277; Ft. Shaw, Mont., 12,189; Delaware Breakwater, 12,058; Cape May, 12,003; New Shoreham, R. I., 11,417; Portsmouth, N. C., 11,308; Hatteras, N. C., 11,285; Sandy Hook, 10,829; Kittyhawk, N. C., 10,353; Eastport, 10,314; Sandusky, 10,029; Barnegat, N. J., 9,848; Indianola, 9,807; Grand Haven, 9,447; Ft. Assinaboine, Mont., 9,446; Fort Benton, 9,134; Cape Henry, Va., 8,952; Milwaukee, 8,851; Chincoteague, Va., 8,545; Cheyenne, 8,540; Buffalo, 8,387; St. Vincent, Minn., 8,335; Boston, 8,095; Macon, N. C., 8,075; Alpena, 8,048; Madison, Wis., 8,008. The *smallest* are La Mesilla, N. M., 1,900; Visalia, 2,239; Florence, Ariz., 2,379; Lynchburg, Va., 2,600; Silver City, N. M., 2,641; Lewiston, Idaho, 2,712; Tucson, Ariz., 2,799; Ft. Missoula, Mont., 2,818; Augusta, Ga., 2,890; Salt Lake City, 2,952.

Local Storms.—Sitka, Alaska, December 19th, 1881. The following report of a most violent storm, although of late date, but from a very distant station, will be found of interest: Heavy gales, ranging from 30 to 50 miles per hour, accompanied by either rain, sleet or snow, began on the 5th, and continued to date. On the 19th, at 12.30 a. m., the gale increased to a hurricane, with violent gusts of over 70 miles per hour from the east, but no precipitation; temperature from 40° to 43°. At 1.55 a. m., storm showed no abatement in violence, at which time frequent observations were commenced with the following results: 1.55 a. m. barometer 29.06, thermometer 40°, wind E., 46 miles; 2.15 a. m., 28.99, 40°.5, E., 60; 2.36 a. m., 28.99, 40°, E., 64; 2.45 a. m., 28.98, 40°.5, E., 64; 3.07 a. m., 28.96, 40°.5, E., 62; 3.20 a. m., 28.96, 40°.5, E., 64; 3.30 a. m., 28.95, 40°.5, E., 64; 3.45 a. m., 28.92, 40°.5, E.,

66; 4.10 a. m., 28.89, 39°.5, E., 68; 4.30 a. m., 28.89, 39°, E., 56; 5 a. m., 28.82, 40°, E., 44; 5.30 a. m., 28.79, 40°, E. 46; 5.45 a. m., 28.80, 42°.5, SE., 44; 6.40 a. m., 29.04, 41°.5, SE., 41. At 6 a. m. the hurricane was terrible in the extreme, the castle (place of observation) rocked like a cradle and it seemed every moment as if the building would be moved from its foundation. At this juncture there was a loud crash as if the building were rent in twain and it shook more violently than before. Upon ascending to the roof a magnificent but awful scene met the gaze, sheet lightning flashed in fantastic shapes over the inky black sky, with fearful rapidity. Oceanward the waves were milky white with foam and their roar was heard above that of the storm. All the glass in the tower windows was broken and a portion of the roof blown away. The iron pointers beneath the anemoscope were so twisted as to be rendered useless. About this time the hurricane reached its maximum velocity, 80 miles, continuing for about five minutes. From this time until the following morning the storm gradually abated. 20th, 10 a. m., tide unusually high. In the harbor one steamer and a schooner, both of which were attached to a buoy, which was supposed to be immovable, had drifted over two cable-lengths from their original position. Most of the out-buildings along the beach were demolished and floated out to sea in small fragments. The roofs of a large number of houses in the village were seriously damaged, notably that of the castle, the church and the Custom House. Nearly all of the fences along the beach were prostrated. 11.30 a. m., gale abating; very heavy sea in the harbor. The bell-tower of the Sitka Mission House was thrown down in a perfect wreck. In the Indian village seven of the houses were unroofed and two of them partially destroyed. From various reports concerning the experience of many people in the village, it would appear very probable that a slight shock of earthquake occurred at about 6 a. m. or a short time before the occurrence of the maximum velocity of the hurricane. At 5.45 a. m. a quick, sharp report was heard, as if the building had been rent in twain. A few seconds after this report the large chimney of the guardhouse fell down, and in the Custom House a double door and frame work of solid logs was thrown down, the latter being separated from the side walls on the top and sides more than two inches. At the ware-house the outside entrance door had settled so much that it was only with great difficulty that it could be opened. In the office the floor and central wall were considerably disturbed and the clock which hung against the wall was found to be so far removed from the perpendicular that the pendulum touched the glass door. The direction of movement of shock was from northwest to southeast. The wind directions during the hurricane were from east slowly veering to southeast. The most violent gusts came from the south, veering slowly to the southwest and abating at a point a little west of southwest. The hurricane was one continuous, steady roar from east and southeast, changing its character to gusts of fearful violence from the south, with comparative lulls or calm spells at short intervals. 21st, 7 a. m., gale from the east increasing steadily up to 11.30 a. m., when a sudden gust shook the building with fearful force. The anemometer cups were carried away, but replaced again after a short interval. At noon found it impossible to take reading of the anemometer dial, owing to the violence of the wind and the thick, stinging sleet. The following observations were taken at short intervals: 11.19 a. m., barometer 29.04, thermometer 36°, wind E. 41 miles, cloudy; 11.30 a. m., 29.03, 36°, E. 40, cloudy; 12.10 p. m., 28.99, 36°.5, E. 42, sleet; 12.30 p. m., 29.02, 35°, E. 44, heavy snow; 12.45 p. m., 28.99, 36°, E. 45, heavy snow; 1.15 p. m., 28.99, 36°, E. 36, light snow; 2 p. m., 28.94, 36°, E. 40, light snow; 2.20 p. m., 28.93, 37°, E. 47, light snow; 2.50 p. m., 28.94, 37°.5, E. 47, light snow; 3.07 p. m., 28.91, 38°, E. 44, light snow; 3.20 p. m., 28.90, 38°, E. 44, light snow. This storm, like that of the 19th, began with wind from the east, gradually veering to the south, when the temperature increased and a thaw and rain set in, continuing until midnight. Heavy gales, with rain or snow, con-

tinued to the end of the month as follows: 22d, E. 42 miles; 23d, NE. 33; 24th, SE. 40; 25th, SE. 32; 30th, E. 32; 31st, SE. 28. Austin, Tex., 1st, heavy northwest gale, which at times almost reached the violence of a tornado. Fences and trees were blown down and many buildings unroofed. Several houses were entirely demolished. Astoria, Or., 9th, violent southerly gale causing considerable damage to shipping in the harbor and in the city to signs, show windows, fences, shade trees and out-buildings. Ilwaco, Or., 9th, large ware-house leveled to the ground and several buildings unroofed. "The road across the portage to the weather beach was obstructed with fallen trees to such a degree that it will require a week's work to clear away the debris. From shore to shore across the Columbia bar the river was one mass of seething, milky foam, with tremendous sea." Rock Island, Ill., 21st, violent storm of wind and rain; a large portion of the government bridge, a solid stone and iron structure, was blown down; many buildings more or less damaged. Duluth, 21st, very violent wind storm from NNE., accompanied by driving snow. The sea on Lake Superior ran exceedingly high and all ice in the harbor was broken up. The suspension bridge over the canal badly damaged and rendered impassable. The wind and waves formed a huge breakwater of ice along the exposed shore. Pine Bluffs, Ark., 2d, "violent and desolating wind storm" passed over a portion of Jefferson county, laying waste cabins, houses, fences and trees. One person was killed and several injured. Findlay, Ohio, 21st, violent wind storm during early morning. Numerous out-buildings and fences demolished, trees uprooted. Buffalo, 22d, violent southwesterly gale. In some portions of the city it seemed to attain the violence of a tornado. For a space of about three minutes the anemometer registered a velocity of 80 miles per hour. A waterspout was reported to have been seen on Lake Erie between this city and Erie about the time the gale struck Buffalo. Umatilla, Or., 16th, heaviest wind storm experienced at this station for several years. Began at 10 a. m., violence gradually increasing. At 1 p. m. wind velocity 40 miles per hour, soon after reaching the maximum velocity of 56 miles from the north, when the wind suddenly died away. Dense clouds of sand filled the air and no one ventured out of doors; all business suspended. The sand and gravel dashed against windows and the sides of buildings, making a noise similar to that of heavy sleet. Olympia, Wash. Ty., 9th, heavy wind storm from south, accompanied by rain, which began at 11 a. m. Trees, fences and out-buildings were blown down, signs torn off and windows broken. Maximum velocity, 42 miles per hour, continued from 2.15 to 2.30 p. m. Delaware Breakwater, 4th, terrific storm prevailed throughout the day, the wind reaching a velocity of 56 miles. The sea washed over the office building, filling the rain-gauge and breaking down the wires of the "Breakwater air line." Schooner *Ellen Rockland*, from Portland to Norfolk, ran on the ice-break at 8.30 a. m. Eastport, Me., 5th, one of the severest storms that has visited this section for a long time. Two vessels went ashore near West Quoddy; others lost deck loads. 22d, very severe storm; about 50 feet of the breakwater to the entrance of Houstin's ship yard was destroyed, entailing a loss of about \$500. Several wharves were slightly damaged. New Haven, 21st, heavy gale; ten canal boats, loaded with coal, were sunk off Bridgeport, involving a loss of \$3,700. Chincoteague, Va., 1st, Schooner *Dolly Varden* wrecked on the beach during gale. New Orleans, 3d, 8.20 p. m., during heavy gale steamers *Thomas Dean* and *Frank Porgoud* were driven from their moorings and crushed the N. O. Pacific R. R. wharves, causing a large amount of damage. A coal fleet of ten barges were sent adrift, five of which were sunk in mid-stream; loss estimated at \$5,000. Mobile, 28th, between 9 a. m. and 1 p. m., severe wind and rain storm; telegraph lines prostrated; considerable damage done. Little Rock, 27th, 7.30 to 10.30 p. m. severe storm accompanied by thunder and heavy rain; streets were deluged; in some places water reached a depth of 3 feet. The electric display was unusually brilliant. The air was so charged with ozone that the odor was very ap-

preciable and persons subject to catarrhal affection complained of the irritating effect produced upon the throat and lungs. Several cases of damage from lightning have been reported. Columbus, Ohio, 21st, 6 p. m., severest storm experienced for years. In less than half an hour the wind increased from 10 to 40 miles per hour; buildings, chimneys, fences, etc., were blown down. Hogansville, Ga., 28th, violent wind storm; several houses destroyed. Spiceland, Ind., 21st, 3 to 3.30 a. m., very high winds, out-buildings blown down and unroofed, trees, etc., blown down. Coalville, Utah, 9th, and 16th, heavy wind storms; large number of trees were blown down and the water in the Sound made very rough.

VERIFICATIONS.

Indications.—The detailed comparison of the tri-daily indications for February, 1882, with the telegraphic reports for the succeeding twenty-four hours, shows the general percentage of verifications to be 87.16 per cent. The percentages for the four elements are: Weather, 86.44; Direction of the Wind, 84.25; Temperature, 88.15; Barometer, 89.72 per cent. By geographical districts they are: For New England, 90.1; Middle Atlantic States, 92.5; South Atlantic States, 86.9; Eastern Gulf States, 85.8; Western Gulf States, 86.9; Lower Lake Region, 88.5; Upper Lake Region, 84.5; Tennessee and the Ohio Valley, 87.8; Upper Mississippi Valley, 86.1; Lower Missouri Valley, 81.1; Northern Pacific Coast Region, 98.2; Middle Pacific Coast Region, 97.1; Southern Pacific Coast Region, 93.7. There were 100 omissions to predict (37 being due to the absence of reports from the Pacific coast) out of 3,444, or 2.90 per cent. Of the 3,344 predictions that have been made, 126, or 3.77 per cent. are considered to have entirely failed; 119, or 3.56 per cent. were one-fourth verified; 351, or 10.50 per cent. were one-half verified; 159, or 4.75 per cent. were three-fourths verified; 2,589, or 77.42 per cent. were fully verified, so far as can be ascertained from the tri-daily reports.

Cautionary Signals.—139 Cautionary signals were displayed during the month of February, 1882, of which 130, or 93.52 per cent. were fully justified by winds of twenty-five miles per hour, or over, at or within a radius of 100 miles of the station. 76 Off-shore signals were displayed, of which 60, or 78.94 per cent. were fully justified; 68 or 89.47 per cent. were justified as to direction; 76, or 100.0 per cent., were justified as to velocity. 52 Off-Shore signals were changed from Cautionary. Two Northwest signals were displayed, both of which were fully justified. 217 signals of all kinds were displayed, of which 192 or 88.48 per cent., were fully justified. The above does not include signals ordered at 69 display stations, where the velocity is only estimated. 183 winds of 25 miles or more, were reported, for which no signals were ordered. 27 signals were ordered late.

NAVIGATION.

Stage of Water in Rivers.—In the table on the right-hand side of chart No. III are given the highest and lowest stages of water as observed at Signal Service stations during the month of February, 1882. Throughout the Lower Mississippi and Ohio Valleys and along the Red and Arkansas rivers the heaviest floods for years prevailed during the month. In consequence the stage of water in these rivers has been remarkably high, as shown by the following figures: The Red River reached its highest stage at Shreveport on the 21st, being 31 feet and 5 inches above low water-mark, or 18 inches above the danger-line. The Arkansas river reached its highest stage at Little Rock on the 24th, being 21 feet and 8 inches above low water mark. The Missouri was frozen over during the month at Yankton, but reached its highest stage (a very moderate one) on the 14th at Leavenworth, and on the 27th and 28th at Omaha. The Mississippi remained frozen during the month at St. Paul and LaCrosse, and at a low stage from the 1st to 28th at Dubuque, Davenport and Keokuk. From St. Louis to New Orleans reached its highest stage as follows: St. Louis, 22nd, 28 feet and 3 inches above low-water mark, or 21 inches

below the danger-line; Cairo, 25th and 26th, 51 feet and 10½ inches above low-water mark, or 11 feet and 10½ inches above the danger-line; Memphis, 28th, 35 feet and 7 inches above low-water mark, or 19 inches above the danger-line; Vicksburg, 28th, 44 feet and 8 inches above low-water mark, or 3 feet and 8 inches above the danger-line; New Orleans, 28th, 15 inches above the danger line. The Ohio river reached its highest stage at the various stations as follows: Pittsburgh, 22nd, 21 feet and one inch above low-water mark, or 13 inches above the danger-line; Cincinnati, 21st, 58 feet and 7 inches above low-water mark, or 8 feet and 7 inches above the danger-line; Louisville, 22nd, 37 feet and 2 inches above low-water mark, or 38 inches above the danger line. The Cumberland at Nashville reached its highest stage on the 1st, 43 feet and 6 inches above low-water mark, or 18 inches above the danger-line. The Tennessee at Chattanooga reached its highest stage on the 1st, 29 feet and 11 inches above low water mark, or 13 inches below the danger-line. The Monongahela remained at a moderate stage throughout the month; highest water at Morgantown on the 9th, and at Pittsburgh on the 22nd. No marked change occurred in the Savannah, Williamette, Sacramento, Mobile and Colorado rivers; those in the extreme western States reached their highest stage on the 27th.

Ice in Rivers and Harbors.—*Connecticut River:* New Haven, 17th, ice broke up. Woodstock, Vt., 28th, river nearly clear of ice. *Delaware River:* Cocheton, 14th, heavy ice gorges, village flooded; several buildings crushed by the ice and carried down the river. *Hudson River:* Newburg, 14th, river open at this point after having been closed since January 23d. Poughkeepsie, 14th, all ice south of Fort Montgomery is on the move. Albany, 14th, ice began moving; 17th, moved down about 19 miles and gorged on a bar at Doves Point causing the water to back very rapidly, which shortly afterwards was running at the rate of seven miles per hour in upon the city, flooding stores and cellars and causing considerable loss to merchants; 18th, river almost free of ice; 19th, river entirely free of ice; 22d, 23d, 24th, floating ice; 25th, frozen over. *Columbia River:* Umatilla, Or., 18th, river frozen; 19th, full of floating ice; 26th, clear of ice. Portland 21st, floating ice. *Palouse River:* Colfax, Wash. Ty., 28th, ice broke up during p. m. *St. Clair River:* Port Huron, 1st, river clear of ice; 2d, 5th, 6th, 8th, 22d, 23d, floating ice. *Grand River:* Grand Haven, 1st, free of ice; 14th, first sailing vessel of season arrived. Lansing, 21st, river closed; 25th, river open. *Rock River:* Rockford, Ill., 23d, frozen over; 26th, ice going out. *Housatonic River:* South Lee, Mass., 17th, ice passed out of the mill-ponds on the river as far up as Pittsfield; no damage done to mills or bridges. *Thunder Bay:* Alpena, 12th, floating ice; 13th, clear of ice; 18th, 19th, partly frozen. *Thunder Bay River:* Alpena, 13th, partly clear of ice; 16th, clear of ice, navigation open; 18th, 19th, partly frozen. *Lake Superior:* Duluth, 22d, lake frozen. *Lake Michigan:* Marquette, 5th, harbor frozen. *Lake Erie:* Cleveland, 6th, ice disappearing; 11th, ice broke up and floated out into the lake. Toledo, 25th, navigation open; 27th, navigation fully open for coasting vessels. *Sandusky Bay:* Sandusky, 11th, ice moved slightly; 12th, ice becoming very soft; 13th, ice entirely disappeared from bay; 23d, bay frozen over; 28th, ice in bay softening. *Maumee River:* Toledo, 13th, ice breaking up; 14th, river fully open, harbor clear of ice. *Niagara River:* Buffalo, 14th, ice moving out of river. *Oswego River:* North Volney, N. Y., 19th, river frozen. *Lake Champlain:* Charlotte, Vt., 4th, partially closed by ice; 15th, much floating ice; 23d, lake closed; 28th, ice moving in middle of lake. *Mississippi River:* Burlington, 10th, ice breaking up; 11th, on the immediate front, and on the Illinois side, the ice completely broke up and passed out; 12th, clear of ice; 23d, large quantity of floating ice; 23d, 24th, 25th, floating ice. Dubuque, 4th, ice becoming unsafe for crossing; 6th, breaking up; 11th, melting rapidly, river nearly clear in front of levee; 12th, ice gorge broke at 10 a. m. near Eagle Point; 11 p. m. river full of ice; 4 p. m., nearly clear, ferry-boat running;

21st, 23d, floating ice, ferry-boat making trips with great difficulty, ice 10 inches thick in sloughs and lakes. ice cutting resumed; 26th, clear of ice. Keokuk, 22d, river full of floating ice; 27th, free of ice. La Crosse, 13th, ice becoming weak, crossing thereon suspended. St. Paul, 27th, ice gathering suspended, ice unsafe for crossing. Clinton, Iowa, 12th, clear of ice, navigation open; 22d, 23d, heavy drift ice. Guttenburg, Iowa, 12th, ice broke up. Muscatine, Iowa, 6th, ice broke up at 1 p. m.; 7th, ferry boats running. *Missouri River:* De Soto, Nebr., 12th, ice broke in river. Omaha, 13th, river open and gorged; 14th, river open; 21st, frozen; 26th, ice breaking up; 27th, river open. Leavenworth, 7th, slush ice in river; 9th, clear of ice; 21st, 22d, 23d, 24th, slush ice in river; 25th, clear of ice.

Floods.—The remarkably heavy rains of the last half of January in the Ohio, Central and Lower Mississippi Valleys considerably abated during February, but the severity of the floods did not. The rain continued incessant and moderately heavy in these regions, and the destruction of life and property together with the exceedingly high stage of water was in many places without precedent. *Alabama:* Montgomery, 2d, great damage throughout the central portion of the State by heavy floods along the Warrior, Bigbee and Tombigbee rivers. *Arkansas:* Helena, 17th, river 3½ inches above the highest water ever known and slowly falling. The levee broke at a point about two miles below the city and again near Westover, submerging the country for a distance of several miles. The embankment of the Iron Mountain and Helena R. R., leading out from the levee was washed away for a considerable distance; all telegraph wires along the railroad carried away. The Midland R. R., flooded and entirely useless. All low lands south of the city submerged, resulting in great distress and loss of property; business entirely suspended. 20th, the principal streets in the central portion of the city, flooded and skiffs and dug-outs are the only means of transportation. Water in the city rising steadily with great destruction of property. Much destitution and distress in the overflowed districts. 24th, river falling at the rate of half an inch every 24 hours. Several miles of the Mobile and Northwestern R. R. washed away. Just below the city 32 plantations, comprising more than 12,000 acres, are all under water. From Memphis to Madison, Ark., a distance of 40 miles to the west, "there is nothing but one wide expanse and waste of water." Little Rock, 23d, river reached the danger-line at 9 p. m.; water covered with floating logs, trees, etc. Owing to a break in the levee 30,000 acres of valuable cotton lands were flooded. 24th, river about 24 feet above low-water mark and rising at the rate of one inch per hour. 25th, river commenced falling. Terry's Ferry, 24th, Arkansas river above its banks and the water rising rapidly; large tracts of land overflowed. Adamsburg, 24th, nearly the entire town inundated and the whole of Pastoria county under water; river now running through Flat Bayou. Pine Bluff, 24th, river above its banks and much damage caused to property. Desha's, 24th, "loss of property by flooding very extensive;" water over three feet deep on the north bank. Morianna, 14th, Longville river unusually high, water over the railroad trestle and all trains delayed. Clarendon, 20th, White river overflowed and the water rising steadily. Chicot, 2d, country flooded for miles; heavy breaks in all the levees and water rising with great rapidity. "People moving their household effects on improvised rafts." *Canada:* Warkworth, Ontario, 1st, Mill river overflowed and considerable property damaged. St. Jacques Achigan, Quebec, 1st, very heavy rains; water so high that people were compelled to move their household property and stock and abandon their homes; highest water ever experienced here. Montreal, 2nd, owing to heavy rains and the rapid melting of the snow in elevated portions of the city, the western section was inundated to a depth of from 4 to 10 feet. "People moved about on improvised rafts;" Grand Trunk Railroad submerged to a depth of from 4 to 6 feet; all travel suspended. *Illinois:* Carlisle, 24th, Okawa river above its banks and considerable property

destroyed; two railroad bridges carried away and travel suspended; passengers transferred in boats to the Vandalia, Ohio and Mississippi trains. Carlinsville, 21st, unusually heavy rain for the past 48 hours; all trains abandoned, bridges and houses swept away and great damage to farms situated in the low lands. Vandalia, 21st, Okawa river overflowed and the bottom lands, comprising an area of about five miles square, submerged to a depth of from 6 to 10 feet. A large amount of live stock and lumber swept away. Water higher than at any time since 1875 and still rising; many highway bridges swept away. Bellville, 20th, continued rain for the past 48 hours caused all streams to overflow their banks, flooding fields and doing considerable damage to buildings and fences; track of the Louisville and Nashville R. R. across Silver creek bottom submerged and all trains delayed. Alton, 20th, immense damage to city and railroad property; incessant rain for past 48 hours. Macoupin creek overflowed and all communication with Springfield and Chicago cut off. Wood river overflowed and many farms under water; the river rose from 25 to 30 feet and swept everything before it. In the Wood river bottoms the destruction of property is without parallel in the history of that section of the State. Alton Junction completely inundated; highest water ever known. Springfield, 20th, heavy rains for the past 48 hours. All streams rose with unparalleled rapidity; low lands covered with water from 6 to 12 feet deep. Sangamon river and Lick, Hurricane and Macoupin creeks, 45 miles below this point, higher than ever before known. Railroad travel suspended and telegraphic communication cut off; several heavy bridges washed away. Salem, 20th, country flooded for miles about; many bridges in the country washed away; railroad travel suspended and highways impassable. Mt. Vernon, 23d, heaviest flood for years; great damage to farm property. Mascoutah, 23d, Silver creek overflowed; surrounding country flooded and travel generally impeded. Jerseyville, 20th, highest water for the past 40 years; rain continued without cessation for 36 hours; bridges, fences and buildings washed away. Shelbyville, 20th, Okaw river overflowed; water higher than during the great freshet of 1875; bottom lands completely submerged and all crops a total loss. Tuscola, 20th, great portion of the city under water; flood unprecedented; great damage to property; all trains delayed and telegraphic communication cut off. White Hall, 20th, heaviest rain for many years; great damage to farm and city property and considerable loss of stock; railroad tracks submerged and all travel suspended. Lebanon, 20th, heaviest rain for many years; streams higher than ever before known. Many farms inundated, causing great damage to the wheat crop. Bridges and fences destroyed, incurring a large loss in this respect. Effingham, 20th, rain fell resolutely for past 48 hours. Bridges washed away and all railroad travel suspended. Peoria, 20th, very heavy rains during the past two days, but no damage from overflow. River about 10 feet above low-water mark. Cairo, 23d, 12 m., water reached the top of river gauge, 51 feet above low-water mark or 11 feet above the danger-line. 24th, 1 p. m., break occurred in new levee, but was checked without damage to property, and on the morning of the 26th a similar break occurred with similar results. To provide against overflow for the past few days has cost the city over \$17,000. The water, which owing to great pressure has filtered through the levee, together with the enormous quantity which has fallen during the past few weeks has about inundated the city. In many places the streets were under water and cellars were flooded. Should this "sipe water," as it is termed, rise eight inches higher every street and walk in the city would be under water. At its present stage the water is the highest ever known in this city and the quantity and general extent is unprecedented. 25th and 26th, water in the Ohio reached 51 feet and 10½ inches above low-water mark, or 11 feet 10½ inches above the danger-line, the highest water ever known here. Charleston, 20th, Cossell, Riles and Kickapoo creeks about 10 feet above low-water mark, or 6 inches lower than the flood of 1881; considerable damage to

property. 21st, Embarrass river higher than ever before known, being 31½ inches higher than the great flood of August 2d, 1875; the river rose about 24 feet above low water, or 8 feet above danger line. Damage to the extent of thousands of dollars has been done to bridges, fences, etc., in Coles County. *Indiana:* Madison, 19th, starch factory, saw mills, ship yards, cooper shops and cellars on Ohio street, and the railroad depot flooded; river still rising. New Albany, 21st, large amount of damage to private property; 600 houses under water; portions of city along river front flooded for a distance of two miles; all manufacturing establishments closed. Over 100 feet of the trestle-work, of the Air Line R. R., was washed away. Heavy washouts on other railroads in vicinity. The flood of 1847 lacked two feet of reaching the high-water mark of 1832, while the flood of 1867 was 4½ feet below that of 1832. The flood of 1869 was six inches below that of 1867, and was very destructive to property along the river, as it came on very suddenly. The flood of 1868 was 18 inches below that of the following year. The present flood is still below the high-water mark of 1867. Aurora, 21st, 4 p. m., river higher than during the great flood of 1847; water rose two inches per hour for the past 24 hours. In many streets water from 4 to 6 feet deep; people compelled to move to the second story of their dwellings. Lawrenceburg, 21st, since the night of the 20th all communication with the town was cut off; "almost the entire place was a sea of muddy water;" railroads all washed out, highways submerged and no steamers could effect a landing. About 3,000 people were rendered homeless. "The water attained a depth of 12 feet in the streets and rushed through them with terrible force. Horses, cattle and hogs were left to their fate and soon the rushing torrent was covered with their bodies." The destruction of property and the terrible misery accompanying the ravages of this flood are without precedent in the history of this section of the State. Evansville, 21st, river remarkably high for past six weeks; river now above its banks and steadily rising. The Kentucky shore entirely submerged to the tops of the trees; 6 p. m., water 43 feet and 5 inches above low-water mark. 22d, water 44 feet above low-water mark or 2 feet and 3 inches below the highest water ever known, the great flood of 1867. Orleans, 21st, country for miles about deluged with rain; over 20 squares of northwest portion of city flooded from one to six feet deep. Lost river overflowed, washing away fencing and buildings; hogs and sheep drowned in considerable numbers. Terre Haute, 21st, Wabash river rose 66 inches in past 21 hours and still rising at the rate of 2½ inches per hour, with 21 feet in the channel. Railroads badly damaged and all communication suspended. Highest rise of late years occurred in 1875, when there was 27 feet and 8 inches in the channel. Madison, 21st, river rising rapidly, water within two feet of the great flood of 1847. Nearly 1000 people thrown out of employment; manufactories and residences flooded; great damage to private as well as corporate property. Hagerstown, 20th, heavy rain for the past 48 hours. Many streams "bank full" and others spreading over the surrounding country. Vevay, 18th, Ohio river "over its boundaries;" lower part of city inundated, creeks and streams much swollen. 19th, river still rising, people leaving their homes; all the adjacent lands along the river submerged; many frame buildings floated away. 21st, much lumber and many sawlogs have floated away. 22d, river beginning to recede. 23d and 24th, river falling slowly. Laconia, 22d, Ohio river reached its highest point to-day; as compared with former great floods, it is as follows: 34 inches below the flood of 1847; 33 inches above that of 1853; and 1 inch above that of 1867. The bottom lands overflowed, causing immense damage to property. St. Meinrad, 21st, Anderson creek higher than ever before known. Rising Sun, 21st, Ohio river higher than at any time since the great flood of 1847. *Indian Territory:* Ft. Gibson, 21st, river rising rapidly, and full of driftwood. *Kentucky:* Covington, 19th, water over the side walks near the suspension bridge; river rising rapidly. Carrollton, 19th, principal streets several feet under water; Kentucky river un-

usually high and rising rapidly; 20th, over 40 dwelling houses, two hotels, two saw mills and much other property flooded by high water. About 60 families have been rendered homeless. Most of the highway bridges in the surrounding country have been washed away. Milton, 19th, many of the streets several feet under water; considerable destruction of property. Catlettsburg, 21st, heavy land slides along the railroad lines and much damage to property in the surrounding country. Louisville, 19th, river rose nearly 2 feet during the past 24 hours and still rising, with 29½ feet in the canal and 27½ feet in the chute on the falls. Fourth street cut off by water from all communication with the river; all cellars and first floors in that vicinity flooded. 20th, water rising at the rate of 2 inches per hour. In some portions of the city water 4 to 6 feet deep. Most of the distilleries compelled to close and many manufactories surrounded by water. Highest water since 1867. 22d, river reached its highest point; much damage has been sustained by manufacturers and others living along the river front. 23d, river falling. *Louisiana*: Lake Providence, Carroll co., 2d, county flooded for miles and people compelled to abandon their homes. Heaviest flood for past 30 years. The flood of 1844 was exceeded about 2 feet by that of 1858, the latter about 2 feet by the flood of 1862; the flood of 1862 was exceeded about 18 inches by the flood of 1876 and 1877, and 34 inches by the flood of 1882. Longwood, 2d, levee broken in several places; plantations flooded and most of the negro cabins swept away; country very desolate. Shreveport, 4th, heavy rain for past 36 hours. The lakes above the city higher than for the past six years. 20th, the high stage of water in the river seriously threatened plantation property, gin houses, stock, etc. Breaks in the levees are reported daily and cause great excitement among planters. New Orleans, 11th, a crevasse 300 feet wide and from 2 to 4 feet deep occurred at Kemp Levee, in Tensas Parish. *Mississippi*: Greenville, 25th, levee broke between Easton Landing and Mound City, flooding the surrounding country. Damage to levees amount to over \$500,000. At Bolivar the levee is "broken as far as the eyecan reach." The levee system is a general wreck; nearly the whole of Bolivar and Washington counties inundated. *Missouri*: St. Louis, 20th, remarkably heavy rains; cellars flooded, sewers obstructed and great damage to embankments and streets. Damage to railroad property in the vicinity of the city unusually large, blockade to railroad travel unprecedented; no trains for 48 hours. About 500,000 feet of lumber carried off by the high water. Rise in the river the most rapid known for the past 35 years. So sudden and great was the rise in the Mississippi between Memphis and Vicksburg that over 270 steamship landings were abandoned in two days. At Forest Park the carp ponds were consolidated into one vast sheet of water. The River des Peres flowing through the park rose above its banks, a condition never before observed by the oldest resident in the neighborhood. Owing to the rapid rise of the water, much freight on the levee, supposed to be out of danger, was submerged before it could be removed. Rosedale, 21st, heaviest flood ever experienced; bottom lands flooded for miles; much damage to farm and city property. Hodi-mont, 21st, flood almost unprecedented; "streams that have remained quiet the whole year round, excepting for an hour or so after a heavy rain, were converted into broad rivers, rushing with the velocity of a mill race." Cheltenham, 21st, River des Peres overflowed, flooding all the manufactories of the city; several hundred men thrown out of employment; over 75,000 bricks destroyed. Barret's Station, 21st, Grand Glaze creek bottom, comprising the whole country between this point and the Meramec river, entirely submerged; hundreds of farms divested of fences and out-buildings. This sudden and extensive rise is without parallel in the history of this section of the State. St. Charles 20th, Big Muddy river overflowed and several bridges carried away; considerable destruction of farm property. *New York*: Saratoga, 2d, high water caused great damage to the Adirondack R. R. bridge. Much loss to private property. Thurman, 2d, 400 feet or rail-

road track covered by a heavy land slide. All streams overflowed. Hadley, 2d, heavy land slide covering 100 feet of railroad track; lands submerged and buildings flooded. *North Carolina*: Wilmington, 11th heavy freshet along Black river. At Maultsby's Point, heaviest known for years. Over 30 head of cattle drowned and much other property lost. *Ohio*: Cincinnati, 16th river rising rapidly. 17th, water reached the danger-line, or 50 above low-water mark. 18th and 19th, river rising steadily. 20th, houses on the river front partially submerged compelling the occupants to move their property to the second floors; merchants and manufacturers suffered serious interruption to business. 21st, 4 p. m., river 58 feet and 7 inches above low-water mark or 8 feet and 7 inches above the danger-line; highest water since 1847 when the river rose 63 feet and 6 inches above low-water mark or 13 feet and 6 inches above the danger-line. The highest stage ever known occurred February 17th, 1832 when the water reached 64 feet above low-water mark or 14 feet above the danger-line. In February 1815, the water rose over 50 feet above the low-water mark. The following is an hourly record of the rise as noted at the City Water Works on the 20th: 6 a. m., 54 feet, 5 inches; 7 a. m., 54 feet, 7 inches; 8 a. m., 54 feet, 8 inches; 9 a. m., 54 feet, 9 inches; 10 a. m., 54 feet, 11 inches; 11 a. m., 55 feet; 12 m., 55 feet, 2 inches; 1 p. m., 55 feet, 3 inches; 2 p. m., 55 feet, 7 inches; 3 p. m., 55 feet, 10 inches; 4 p. m., 56 feet; 5 p. m., 56 feet, 3 inches; 6 p. m., 56 feet, 5 inches; 7 p. m., 56 feet, 7 inches; 8 p. m., 56 feet, 8 inches; 9 p. m., 56 feet, 10 inches; 11 p. m., 57 feet, 2 inches; midnight, 57 feet, 3 inches. 21st, over a half a mile of the trestle work on the C. and E. N. G. R. R. was washed away. Many large distilleries and other manufactories compelled to suspend operations. Several hundred houses adjacent to the river front had from one to ten feet of water over the first floors. Along Mill Creek many houses were flooded and several buildings were moved from their foundations. 22d, portion of the track of the C. and S. R. R. washed away. Many hogs and cattle drowned. No trains could reach the various depots, and the Plumb street depot was flooded to a depth of five feet. The railroad between this city and Lawrenceburg was washed away in several places. Great damage caused to the road-bed of the Ohio and Mississippi R. R.; loss to railroad property already amounts to several hundred thousand dollars. Along Mill Creek valley as far north as Cummingsville the torrent of water swept away houses, stables, fences and cattle pens. It is estimated that up to this date about 5,000 persons have been temporarily thrown out of employment. The highest rises since 1859 occurred as follows: 1862, January 24th, 52 feet and 3 inches; 1865, March 8th, 56 feet and 3 inches; 1869, February 22d, 57 feet and 3 inches; 1870, January 19th, 55 feet and 3 inches; 1875, August 6th, 55 feet and 3 inches; 1877, January 2d, 53 feet and 4 inches; 1881, February 18th, 53 feet and 1 inch. Zanesville, 19th, Muskingum river very high and rising rapidly. Marysville, 20th, continuous and heavy rains for the past three days and nights. All streams flooded and the valleys in many places covered with water as far as the eye could reach. Batavia Junction, 21st, water highest for several years past. Several railroad lines abandoned. Akron, 21st, Little Cuyahoga river overflowed; trains delayed by heavy washouts. Lancaster, 21st, nearly the whole of Hocking valley under water; great destruction to farm property. The Hocking river overflowed; everything swept away within reach of the rapidly rising water. Country roads impassable. Fremont, 21st, river overflowed and portion of city submerged. Many people compelled to vacate their homes; considerable damage to railroad property. Mt. Vernon, 21st, incessant rain for past 48 hours; heaviest known for many years. Kokosing river overflowed and several bridges swept away. Germantown, 20th, Twin creek overflowed; several bridges carried away and many thousand acres under water. Carlisle Station, 20th, heaviest flood for years; all streams overflowed with large loss of private and public pro-

perty. Dayton, 21st, Miami river reached the high-water mark of the flood of 1881; no damage to property. Logan, 21st, Hocking river higher than for many years; bottom lands submerged. Gambier, 21st, river overflowed; railroad bridge carried away and much other property damaged. New Comerstown, 21st, incessant rain for the past four days. Tuscarawas river and its tributaries overflowed. Wheat fields submerged and fences swept away. Ironton, 21st, river 43 feet and 8 inches above low-water mark and rapidly rising. Circleville, 21st, Scioto river unusually high; 5 p. m., river within one foot of the highest point ever reached, and rising at the rate of one inch per hour. Heavy washouts on the railroads. Columbus, 20th, Scioto river rose rapidly during the day. 21st, river reached the highest point known for years; a number of cellars in northwest portion of the city were flooded. In some instances people were compelled to abandon their homes. A large quantity of lumber was washed away. *Pennsylvania*: Easton, 2d, Delaware river 23 feet above low-water mark and rising rapidly. River filled with lumber and broken rafts. The lower floors of mills in south Easton submerged and considerable damage done to the locks on the Lehigh and Delaware canals. Harrisburg, 21st, Susquehanna eight feet above low-water mark and rising rapidly. Paxton creek overflowed and much damage in surrounding country. Milton, 21st, heavy rain during past 25 hours caused serious washouts on Pennsylvania R. R. and west branch of Pennsylvania canal; streams considerably swollen; west branch of the Susquehanna river very high. *Tennessee*: Tiptonville, 24th, country flooded some distance from the river; buildings carried away and considerable stock drowned. Memphis, 20th, river remained above the danger-line throughout the month; all bottom lands submerged. The extent of territory in surrounding country endangered by the flood has been estimated as containing a population of 30,000. The estimated loss to the cotton crop has been put at 1,000,000 bales. The known loss in some particulars, attending the flood in this region is 30,000 head of stock and 50 human lives. Railroad travel is "terribly demoralized." *Texas*: Navazota, 10th, Navazota and Brazos rivers overflowed and hundreds of cattle drowned in the bottom lands. Dallas, 12th, almost incessant rain prevailed throughout eastern and northern Texas during the past week. Entire country flooded. People find it impossible to visit the towns for trade. Trinity river overflowed and 20 miles of the Texas and Pacific railroad washed away. Reports from all sections show that the rivers are higher than at any time since the great floods of 1852 and 1866. Large quantities of lumber, cordwood, household utensils, bridge timbers and farm implements, together with numerous small buildings and the bodies of dead animals, floated down the principal rivers and their tributaries. Heavy washouts reported on all railroad lines, and most of them abandoned regular trains. The Brazos river overflowed to an unprecedented extent. Scores of country bridges washed away. Reports from Fort Worth state that Trinity river still continues to rise. Corsicana, 3d, very heavy rains continued without much interruption during the past three weeks. During the night two serious washouts occurred on the Texas and St. Louis railroad. Much other damage in surrounding country. Grapeland, 3d, rain has fallen incessantly for several days past. Water courses higher than for the past 20 years. *Vermont*: St. Albans, 2d, Misisqual, Lamville and Minoski rivers overflowed, causing much damage to private and corporate property. Railroad travel suspended. Rivers very much swollen throughout the northern portion of the State. *Virginia*: Petersburg, 14th, in consequence of high water all mills practically ceased operations. Appomattox river higher than for the past five years; water still rising. *West Virginia*: Wheeling, 19th, river 19 feet and 9 inches above low-water mark and rapidly rising. *Washington Territory*: Pomeroy, 28th, snow melting in the mountains, caused a sudden rise in streams; portions of the town were flooded. *High Tides*.—Delaware Breakwater, 21st, unusually high. Chincoteague, Va., 18th, unusually high at 8 a. m.; 21st,

very high from 10 to 11 a. m. Indianola, Tex., 18th, 19th, 20th, 24th, 25th. New York, 21st, very high. Plymouth, Mass., 22d, 3 p. m., violent northeast gale, accompanied by the highest tide for many years. The water invaded the streets and cellars and considerable damage was done at the lumber yards. At one of the yards a large bulk-head was torn away and left in ruins. Swampscott, Mass., 23d, remarkably high tide, overflowing some of the streets. On some parts of the beach the waves dashed to the second story windows of neighboring dwellings. Highest tide for many years. Revere Beach, Mass., 21st, tide so high that it damaged the theatre building, nearly undermining it.

TEMPERATURE OF WATER.

The temperature of water, as observed in rivers and harbors at Signal Service stations, with the average depth at which observations were taken, is given in the table on the left-hand side of chart No. III. Owing to the presence of ice or the breakage of instruments, observations are wanting as follows: Alpena, 1st to 15th, 21st to 28th; Cleveland, 1st to 10th; Detroit, 1st to 5th, 11th, 12th, 19th to 28th; Duluth, 22d to 28th; Escanaba, throughout the month; Buffalo, 1st to 12th, 23d to 26th; Sandusky, 1st to 12th, 23d to 28th; Chicago, 1st to 5th, 24th; San Francisco, 21st; Marquette, 5th to 28th; Burlington, throughout the month; Milwaukee, throughout the month; Toledo, 1st to 14th; Chincoteague, 21st to 28th; Provincetown, station opened on the 15th; Portland, Me., report too late for publication.

ATMOSPHERIC ELECTRICITY.

Auroras.—The display of the 17th, the most important of the month, was observed from Sydney, N. B., westward to points in the Upper Lake Region (Grand Haven being the most westerly) and southward to Atlantic City, N. J., the following stations reporting: Bangor, Me., from 10 p. m. until day-break of 18th. Cornish, Me., all night, altitude from 10° to 15°. Dexter, Me., very bright, no beams. Orono, Me., during the evening. Gardiner, Me., 8 p. m. Mt. Washington, 8 p. m. until a. m. of 18th, a faint light of yellowish white color. Burlington, Vt., from 7 to 11.45 p. m. diffuse light, extending upward 30° from the horizon; no streamers or dark segment. Lunenburg, Vt., and Amherst, Mass., during the evening. Westborough, Mass., 7 to 9 p. m. Williamstown, Mass., 10 p. m., bright band of light in northern horizon; altitude about 5° and stretching through 30° azimuth. Fall River, Mass., 9 p. m., to midnight. Harvard College, Cambridge, Mass., auroral arch bright and broad; not seen early, but thought to be visible about 7.30 p. m.; distinct, later; some streamers about 10.30 p. m. Springfield, Mass., first seen at 7.25 p. m. as a mere glow in the west; at ten p. m. it was visible in the north, and until 11.30 p. m., when last observed. Newport, R. I., from 8.30 to 10 p. m., faint, altitude about 10°; azimuth, 45°. New Shoreham, R. I., from 8 to 11.50 p. m. brilliant; it formed an arch about 15° above the northern horizon and 10° in width; well defined luminous beams were exhibited, and often bright flashes of light would extend from 30° to 40° above the horizon. Southington, Conn., diffuse light. Toronto, Can., during the evening. Rochester, 9.30 p. m., dim aurora with a dark segment of 5° altitude, no streamers visible. Waterburg and Ardenia, N. Y., during the evening. Freehold, N. J., 8.45 to 9.30 p. m. low aurora, only a white glow; altitude 10°. Somerville, N. J., during the evening. Moorestown, N. J., low sheet aurora. Readington, N. J., during the evening. Atlantic City, 9 p. m., faint low aurora. Fallsington, Pa., 9 p. m. Mount Forrest, Can., during the evening. Alpena, Mich., 10.30 to 11.30 p. m., aurora consisted of diffuse light without streamers. Thornville, Mich., 8.30 p. m., no rays; merely a dull diffused light, 20° above the horizon; when last observed, at 10.30 p. m., it remained unchanged. Grand Haven, Mich., 8.30 to 9.30 p. m., faint aurora in northern sky; had the appearance of morning dawn; altitude 5°, azimuth,

20°. Lafayette, Ind., aurora flashing up in the north to a height of 30°, resembling faint sheet lightning. The display of the 8th was reported by the following stations: Eastport, Me., from 9.30 to 11.30 p. m., faint aurora appeared in northern horizon, altitude 15°, color, very faint bluish white. Orono, Me., during the evening. Dexter, Me., bright arch. Gardiner, Me., 9.15 to 11.15 p. m., faint aurora. Burlington, Vt., 7 to 11 p. m., faint aurora; no prominent features. Woodstock, Vt., 9 p. m., faint nebulous light rising 15° or 20° above the horizon. Harvard College, Cambridge, Mass., fine aurora with streamers in the evening; traces visible at 11 p. m. North Volney, N. Y., 9 p. m., brilliant streamers. Ithaca, N. Y., faint auroral light, no striking features. Friendship, N. Y., during the evening. Waterburg, N. Y., 9 p. m., diffuse light in the north, some faint streamers. Toronto, Can., during the evening. Fort Brady, Mich., 9 p. m. Alpena, Mich., 8 to 11.25 p. m., consisting of a diffuse light without streamers. Northport, Mich., 8.20 p. m., consisting of arch of 15° altitude, most brilliant in the northeast. New Corydon, Ind., 5 a. m. St. Vincent, Minn., from 7.30 to 9 p. m., several beams of light extended to a height of from 7° to 10°, but owing to a bank of stratus clouds along the northern horizon, their brilliancy and characteristics were indistinct. Bismarck, Dak., 9 to 11 p. m., appeared as a nebulous light, elevation about 8°. The display of the 5th, was reported by the following stations: New Shoreham, R. I., 7.50 to 9 p. m., faint aurora in the form of an arch, about 15° above the northern horizon and 8° in width. Southington, Conn., 8 p. m. Marquette, Mich., 7.15 to 7.35 p. m., faint aurora. Manitowoc, Wis., during the evening. New Corydon, Ind., 6.30 to 7 p. m., bright white segment, altitude 10°, extension 60°. Riley, Ill., 7.30 p. m., arch 4° broad, altitude 12°; disappeared before 9 p. m. Elmira, Ill., from 7 to 8 p. m. Cresco, Ia., 6.30 to 6.45 p. m., faint aurora; patches of light, forming portions of an arch, and constantly shifting. St. Paul, Minn., 9 p. m., until after midnight; diffuse light of pale yellow, changing to bright orange and pale green; at 11 p. m., there was a well defined arch 15° above northern horizon, from which slender luminous columns shot up towards the zenith with a wavy motion from left to right; they resembled merry dancers. The display of the 6th was reported by the following stations: Dexter, Me., during the evening. Newport, Vt., during the evening. Buffalo, 1.45 a. m., became visible during temporary break in the clouds; it was observed for $\frac{1}{2}$ hour, no well defined arch was formed, it being broken and consisting of numerous bright beams, some extending to an altitude of 30°. Its horizontal limit was from NW. to NE. and was about 8° above the horizon. The whole display had a slight movement from W. to E. Cleveland, O., 11 to 11.30 p. m., diffuse light of straw color; no streamers. Milwaukee, 1 a. m., diffuse light. The following isolated displays were reported: Eastport, Me., 23d, 11 p. m., to midnight, extending from NW. to NE., and to an altitude of 30°. It was so nearly obscured by clouds that no peculiarities were detected. Gardiner, Me., 18th, low diffuse arch; not visible until after 9 p. m. Harvard College, Cambridge, Mass., 11th, 11.30 p. m., faint trace of aurora low down in the north. New York, 28th, 7 p. m., faint aurora, visible until 7.50 p. m., when the sky became obscured by clouds. It appeared as a horizontal light and was characterized by recurring fits of brilliancy; its color was at first, a pale red and later, a bright red. It appeared about 20° E. of N, covering 20° azimuth, and extended about 20° above the horizon; its centre or crown extended upward about 30°. Catawissa, Pa., 18th. Toronto, Can., 9th. Lansing, Mich., 9th. New Corydon, Ind., 10th, 1 to 3 a. m., strong auroral light. Manitowoc, Wis., 9th, 9.30 p. m., with arch; 13th, 11 p. m., with arch. Embarrass, Wis., 12th, 8.30 p. m., faint aurora. Beloit, Wis., 9th. Cresco, Ia., 10th, midnight, faint light in horizontal lines from NW. to NE., probably an aurora. Clinton, Ia., 9th, from early evening till 9 p. m.; it presented the beams usually seen, with a wavy motion. Monticello, Ia., 19th, 10 p. m. Clay Centre,

Kan., 22d, 10 p. m. St. Vincent, Minn., 7th, 8 to 10 p. m., pale diffuse light; 9th, 7 to 10 p. m., brilliant light of greenish color with beams resembling merry dancers; altitude 6° to 15°. Ft. Stevenson, Dak., 12th, 8 to 8.45 p. m., 2 arches, parallel to each other. Ft. Assinaboine, Mont., 20th, first seen at 4 a. m. and ended at 7 a. m.; observed again in the evening, and remained visible until obscured by clouds at 11 p. m.; at 10 p. m., beautiful streamers in large numbers shot upward to a height of 45°, appearing and disappearing in rapid succession. Both auroras extended from NNW. to ENE., azimuth 45°; altitude 25°. Ft. Benton, Mont., 18th, 9 p. m.; 19th, 9 p. m.

Thunder Storms.—They were reported in the various districts on the following dates: New England, 21st; Middle Atlantic States, 21st, 28th; South Atlantic States, 4th, 8th, 9th, 14th, 18th, 21st, 28th; Florida Peninsula, 9th, 28th; East Gulf States, 3d, 8th, 15th, 27th, 28th; West Gulf States, 2d, 3d, 7th, 8th, 12th, 14th, 15th, 19th, 20th, 24th, 25th to 28th; Rio Grande Valley, 2d, 19th, 27th; Ohio Valley and Tennessee, 8th, 12th, 16th to 21st, 23d, 27th, 28th; Lower Lake Region, Hudson, Ohio, 19th; Upper Lake Region, Kalamazoo, Mich., 12th, 13th; Upper Mississippi Valley, 12th, 13th, 16th to 20th, 27th, 28th; Missouri Valley, 7th, 12th, 16th to 21st, 24th to 28th; Middle Slope, 7th, 8th, 12th, 15th, 16th, 19th, 20th, 27th, 28th; Southern Plateau, La Mesilla, N. M., 2d.

Telegraphic Communication interfered with by Atmospheric Electricity.—Chincoteague, Va., 28th, kept up a continuous rattle for about two hours. Ft. Supply, Ind. Ty., 19th, during a. m. showers of sparks shot across the switch-board. Ft. Reno, Ind. Ty., 19th.

OPTICAL PHENOMENA.

Solar halos have been observed in the various districts on the following dates: New England, 4th, 5th, 9th, 15th, 16th, 17th, 20th, 23d, 25th, 26th; Middle Atlantic States, 1st, 2d, 3d, 7th, 8th, 11th to 14th, 16th, 17th, 25th, 26th; South Atlantic States, 2d, 13th, 25th, 26th; Florida Peninsula, Cedar Keys, 19th; Ohio Valley and Tennessee, 1st, 3d, 4th, 6th to 11th, 13th to 19th, 25th, 26th, 28th; Lower Lake Region, 6th to 9th, 11th, 15th, 25th to 28th; Upper Lake Region, 1st, 2d, 4th, 6th, 11th, 12th, 17th, 19th, 22d, 24th; Extreme Northwest, 1st, 6th, 16th, 23d; Upper Mississippi Valley, 3d, 4th, 6th, 8th, 10th, 12th, 14th, 15th, 17th, 18th, 19th, 21st, 22d; Missouri Valley, 3d, 4th, 10th to 15th, 24th, 25th, 28th; Northern Slope, Ft. Assinaboine, 15th; Middle Slope, 3d, 6th, 10th, 12th, 14th, 24th, 27th; Northern Plateau, Umatilla, Or., 3d, and Dayton, Wash. Ty., 17th; Middle Pacific Coast Region, 1st, 2d, 3d, 9th, 15th, 23d, 24th, 26th; South Pacific Coast Region, 5th, 7th, 27th.

Lunar halos have been observed in the various districts on the following dates: New England, 1st, 2d, 3d, 5th, 20th, 23rd, 25th, 26th; Middle Atlantic States, 1st to 7th, 24th, 25th, 26th; South Atlantic States, 7th, 11th, 20th, 25th to 28th; Florida Peninsula, 2d, 3d, 25th, 28th; East Gulf States, 1st, 7th, 24th, 26th; West Gulf States, 1st, 11th, 23d, 26th; Rio Grande Valley, Eagle Pass, 27th; Ohio Valley and Tennessee, 1st to 4th, 6th, 7th, 8th, 11th, 24th to 28th; Lower Lake Region, 1st to 7th, 24th to 27th; Upper Lake Region, 1st, 3d, 4th, 24th, 25th, 27th, 28th; Extreme Northwest, 1st, 5th, 23d, 24th, 26th, 27th, 28th; Upper Mississippi Valley, 1st, 2d, 3d, 7th, 8th, 9th, 13th, 21st, 24th, 26th, 28th; Missouri Valley, 1st, 2d, 4th, 6th, 8th, 10th, 24th, 25th, 26th, 28th; Northern Slope, 1st, 2d, 22d to 26th, 28th; Middle Slope, 3d, 5th, 24th, 25th, 27th, 28th; Southern Slope, 6th, 26th, 27th; Southern Plateau, 3d, 4th, 5th, 8th to 11th, 23d, 24th, 25th, 27th; Middle Plateau, 5th, 23d to 26th; Northern Plateau, 1st, 22d, 23d, 28th; North Pacific Coast Region, Olympia, Wash. Ty., 3d, and Roseburg, Or., 2d; Middle Pacific Coast Region, 3d, 4th, 5th, 15th, 16th, 20th, 26th; South Pacific Coast Region, 3d, 4th, 5th 23d, 24th.

Mirage.—Indianola, Tex., 4th, 8th, 9th. Huron, Dak., from 7 to 8.30 p. m., "making the plains, which were covered with snow, appear like vast perpendicular walls with horizontal tops."

MISCELLANEOUS PHENOMENA.

Meteors.—Rio Vista, Cal., 20th, 10.25 p. m., very brilliant, making the smallest objects distinctly visible for several seconds; its light was much brighter than that of the full moon. Morrison, Ill., 8th. New Corydon, Ind., 8th. Cedar Rapids, Ia., 2d. Yates Centre, Kan., 3d, 10.15 p. m., moving with a slow uniform motion towards the S., color, pale yellow and as bright as Jupiter, path about 20°, no tail or explosion. Fallston, Md., 10th, 8 p. m., very large and brilliant, path S. to N. The light was sufficiently brilliant to cast distinct shadows. Some persons reported the occurrence of a loud explosion, resembling that of a distant powder mill; the meteor finally burst into many fragments. Dexter, Me., 6th, bright. Woodstock, Md., 2d; 10th, very brilliant, exploded like a rocket; 23d, 27th. Fall River, Mass., 26th, 6.30 p. m. Rowe, Mass., 14th. Protém, Mo., 11th, 7 p. m., about the size of Jupiter, started near the zenith and shot toward the western horizon; 23d, 7.30 p. m., apparently double the size of Jupiter; when first observed it was a few degrees S. of zenith and pursued a southerly course; before disappearing a portion of it separated from the main body and shot upward; a small and beautiful blaze followed in its track; no report was heard. Vineland, N. J., 15th. Palermo, N. Y., 10th. Waterburg, N. Y., 3d. Elsworth, N. C., 10th. Flemington, W. Va., 11th. Des Moines, Ia., 4th, 4.15 a. m., first appeared near horizon and passed from W. to E.; it resembled a large ball of fire; objects in vicinity were rendered clearly visible; the light lasted about 3 seconds. A few persons, residing in Boone and Greene counties, stated that they were awakened by a loud report, as of a ten pound cannon. The meteor was reported to have been seen in several other counties. Fort Bayard, N. Mex., 6th. Sacramento, Cal., 20th, 10.20 p. m., very brilliant; seen through the clouds, it gave a purple light; no noise or explosion.

Zodiacal Light.—New Haven, 14th, 15th, 18th; Nashville, 4th, 5th, 6th, 9th, 10th, 11th, 17th; St. Vincent, Minn., 4th, 14th; Springfield, Ill., 3d, 5th, 6th, 8th, 14th; Dayton, Wash. Ty., 6th, 10th, 17th, 18th; New Corydon, Ind., 5th, 8th, 9th, 10th, 14th, 15th; Spiceland, Ind., 14th; Wabash, Ind., 5th, 15th; Clinton, Iowa, 7th, 8th, 9th, 14th, 15th, 16th; Cresco, Iowa, 7th, 8th, 13th; Monticello, Iowa, 1st, 9th, 10th, 13th, 15th; Dana, Iowa, 7th, 8th, 9th, 12th, 13th, 14th, 15th; Cedar Rapids, Iowa, 14th, 15th; Yates Centre, Kan., 4th, 5th, 7th, 8th, 9th, 11th, 12th, 13th, 16th; Cornish, Me., 11th, 14th, 18th; Sandy Springs, Md., 8th; Cambridge, Mass., 15th, 24th; Somerset, Mass., 6th, 8th, 10th, 11th, 15th, 17th, 18th; Rowe, Mass., 14th; Northport, Mich., 17th; Northfield, Minn., 8th, 9th, 13th, 14th, 16th; Freehold, N. J., 10th, 18th; Atlantic City, N. J., 6th, 7th, 8th, 10th, 11th, 14th, 15th, 17th, 18th; Waterburg, N. Y., 6th, 13th, 14th, 15th; Elsworth, N. C., 10th, 11th; Bellefontaine, Ohio, 4th, 5th, 6th, 14th, 16th; Albany, Or., 17th, 18th; Dyberry, Pa., 5th, 10th; New Ulm., Tex., 12th; Wytheville, Va., 6th, 10th, 11th.

Migration of Birds.—*Geese flying southward:* Dana, Ia., 15th; Delaware Breakwater, 2d; Castroville, Tex., 18th; Indianapolis, Ind., 21st; Rapid City, Dak., 12th; Sacramento, Cal., 5th. *Flying northward:* Hector, N. Y., 27th; Bellefontaine, O., 12th; Austin, Tenn., 9th; Elmira, Ill., 12th; Clinton, Ia., 10th, 12th; Fort Madison, Ia., 7th, 8th, 23d, 24th; Monticello, Ia., 11th, 12th; Dana, Ia., 28th; Independence, Kan., 14th, 18th; Yates Centre, Kan., 5th; Protém, Mo., 28th; Clear Creek, Nebr., 3rd; Genoa, Nebr., 28th; Delaware Breakwater, 7th, 13th; Erie, Pa., 28th; Cairo, Ill., 16th; Omaha, Nebr., 6th, 27th; Red Bluff, Cal., 8th, 9th. *Ducks flying northward:* Charleston, Ill., 6th, Des Moines, Ia., 10th, 11th; Genoa, Nebr., 28th; Fort Gibson, 19th; Indianola, Tex., 20th, 23d; Morgantown, W. Va., 18th. *Flying southward:* Charleston, Ill., 21st. *Pigeons flying northward:* Guttenburg, Ia., 10th.

Prairie and Forest Fires.—Ft. Gibson, Ind. Ty., 10th, 11th, 12th; Ft. Stevenson, Dak., 5th, 8th, 10th, 11th; Bismarek, Dak., 13th, 14th; Yankton, 5th, 6th, 7th, 8th, 9th, 14th; Hu-

ron, Dak., 6th, 7th, 8th, 10th, 15th, 16th; Deadwood, Dak., 28th; Dodge City, 6th; Ft. Supply, Ind. Ty., 5th, 6th, very extensive, 12th; Ft. Hall, Dak., 6th; Protém, Mo., 5th; Genoa, Neb., 3d to 15th; Wellington, Kan., 12th to 16th.

Polar Bands.—Punta Rassa, Fla., 5th; Nashville, Tenn., 12th; Ft. Stevenson, Dak., 9th, 11th; Florence, Ariz., 6th; Sacramento, Cal., 22d; New Corydon, Ind., 1st to 6th, 8th, 18th, 25th; Yates Centre, Kan., 10th, 12th, 13th; Vineland, N. J., 2d, 3d, 11th, 14th, 17th, 18th; Woodstock, Vt., 2d, 8th, 23d; Wytheville, Va., 2d, 17th, 18th.

Earthquakes.—Pagosa, Springs, Col., 11th, 1.30 a. m., heavy shock. San Geronio, Cal., 3d, 2.40 a. m., sharp shock, shaking the house and rattling the windows; direction apparently from S. to N., duration about 30 seconds.

Sand Storms.—Stockton, Tex., 7th, 27th; Yuma, Ariz., 6th, 17th; Camp Thomas, Ariz., 11th, 14th, 17th; Umatilla, Or., 14th, 15th, 16th; Ft. Cummings, N. M., 27th.

Sunsets.—The characteristics of the sky as indicative of fair or foul weather for the succeeding twenty-four hours, have been observed at all Signal Service stations. Reports from 187 stations show 5,177 observations to have been made, of which 27 were reported doubtful; of the remainder, 5,150, or 84.7 per cent., were followed by the expected weather.

Sun Spots.—The following record of observations has been forwarded by Mr. D. P. Todd, Director of the Lawrence Observatory, Amherst, Mass.:

DATE— Feb., 1882.	No. of new		Disappea'd by solar rotation.		Reappea'd by solar rotation.		Total No. visible.		REMARKS.
	Gr'ps	Spots	Gr'ps	Spots	Gr'ps	Spots	Gr'ps	Spots	
1, 11 a. m.	1	4	1	6	1	4	4	18	
2, 9 a. m.	0	0	1	3	0	0	3	15	
3, 11 a. m.	1	5	0	0	0	0	4	20	
4, 10 a. m.	0	0	0	0	0	0	3	35	
5, 5 p. m.	0	5	0	0	0	6	3	35	
6, 11 a. m.	1	10	0	0	0	0	4	30	
7, 11 a. m.	2	10	0	0	1	3	6	60	
12, 12 m.	0	0	0	5	0	0	6	55	
14, 12 m.	1	10	1	5	1	2	6	60	
15, 11 a. m.	0	5	0	5	0	5	6	60	
16, 11 a. m.	0	0	1	5	0	0	5	55	
17, 11 a. m.	0	0	1	10	0	0	4	45	
18, 11 a. m.	0	0	0	0	0	0	3	30	
20, 11 a. m.	1	5	0	5	1	5	4	20	
23, 11 a. m.	1	5	0	0	0	0	4	25	
24, 10 a. m.	0	0	1	5	0	0	3	30	
25, 4 p. m.	1	5	0	5	0	0	4	20	
26, 4 p. m.	0	0	1	4	0	0	2	10	
27, 10 a. m.	1	1	0	0	1	1	2	10	

†Approximated. Faculae were seen at the time of every observation.

Mr. William Dawson, of Spiceland, Ind., reports: 1st, 4 groups, 25 spots. 3d, 5 groups, 20 spots, one large spot east and one west. 5th, 4 groups, 20 spots; air very poor. 8th, 5 groups, 100 spots; air good. 13th, 6 groups, 36 spots; air very poor. 14th, 6 groups, 60 spots; air very good. 15th, 8 groups, 72 spots; air good. 25th, 4 groups, 14 spots; air good. Mr. David Trowbridge, at Waterburg, N. Y., reports: 11th, 7 groups, 24 spots; some groups and spots large. 14th, 5 groups, 16 spots; groups same as observed on 11th; two of the groups of the 11th have disappeared; facula in the west. 15th, 7 groups, 20 spots; one group appeared by rotation and one has divided into two; faculae in the west. 18th, 3 groups, 5 spots. 24th, 2-groups, 3 spots. 25th, 2 groups, 2 spots; the western group of 24th has gone out and a new one in the east has arisen. 27th, 2 groups, 3 spots; one group has just appeared by rotation. 28th, groups and spots same as on 27th. The following record of observations has been forwarded by Mr. A. S. Bender, Sacramento, Cal.: 7th, 11.30 a. m., 6 groups, 35 spots; 3 of the groups were of 2 spots each, 1 group of 3 spots, and possibly the other groups containing the great number of small spots may be but one. 10th, 12 m., and 11th 12 m., same as observed on 7th. 13th, 11.30 a. m., 7 groups, 35 spots; some of the spots very small. 14th, 1 p. m., 7 groups, 35 spots; 1 new group, 1 spot; 1 group disappeared. 15th, 1 p. m., 7 groups, 35 spots; light clouds prevented close observation. 16th, 2 p. m., 5 groups, 25 spots, not quite clear. 18th, 12 m., 3 groups, 12 spots; 1 group, 2 spots disappeared by rotation. 19th, 12 m., 3 groups, 8 spots, perhaps more; not quite

clear. 21st, 1.30 p. m., 2 groups, 5 spots; 1 group, 1 spot disappeared by rotation. 22d, 12 m., 4 groups, 13 spots; 2 new groups, 2 spots, one of which probably appeared by rotation. 24th, 2 p. m., 3 groups, 10 spots; 1 group, 1 spot disappeared by rotation; not quite clear. 25th, 1 p. m., 1 group, 1 spot; 1 of the new, and a large dim group disappeared. 26th, 2.15 p. m., 1 group, 1 spot. 27th, 11.30 a. m., 3 groups, 5 spots; 1 group, 1 spot reappeared by rotation. One of the spots which appeared on the 22d, and disappeared on the 25th, has now reappeared, and each of the single spots has divided and become two. 28th, 12 m., 1 group, 1 spot; the 2 small groups are probably not gone, but may be hidden by light clouds while permitting the large new spot to be seen. Faculae visible on all clear days.

PUBLISHED BY ORDER OF THE SECRETARY OF WAR:

W. B. HAZEN,

Brig. & Bvt. Maj. Gen'l;

Chief Signal Officer, U. S. A.

Copy furnished for

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This Paper is furnished by the Government of the United States, without charge, to the Co-operating Observers acting with the Signal Office in the collection of Simultaneous Reports.

The maps for this
month ~~not~~ herewith
are delayed and will
be sent hereafter.

No. 1.

WAR DEPARTMENT WEATHER MAP.

SIGNAL SERVICE, U. S. ARMY.
DIVISION OF TELEGRAMS AND REPORTS FOR THE BENEFIT OF COMMERCE AND AGRICULTURE.

Note.—The Roman letters show number and order of areas of low barometer. The figures above the lines show the days of the month; those below, 1, 2 and 3, indicate respectively the 7 A. M., the 3 P. M., and 11 P. M. (Washington mean time) observations. The small circles on the lines indicate the position of the centre of the area of low barometer on the day and report written respectively above and below the line.

TRACKS OF CENTRES OF AREAS OF LOW BAROMETER FOR FEBRUARY, 1892

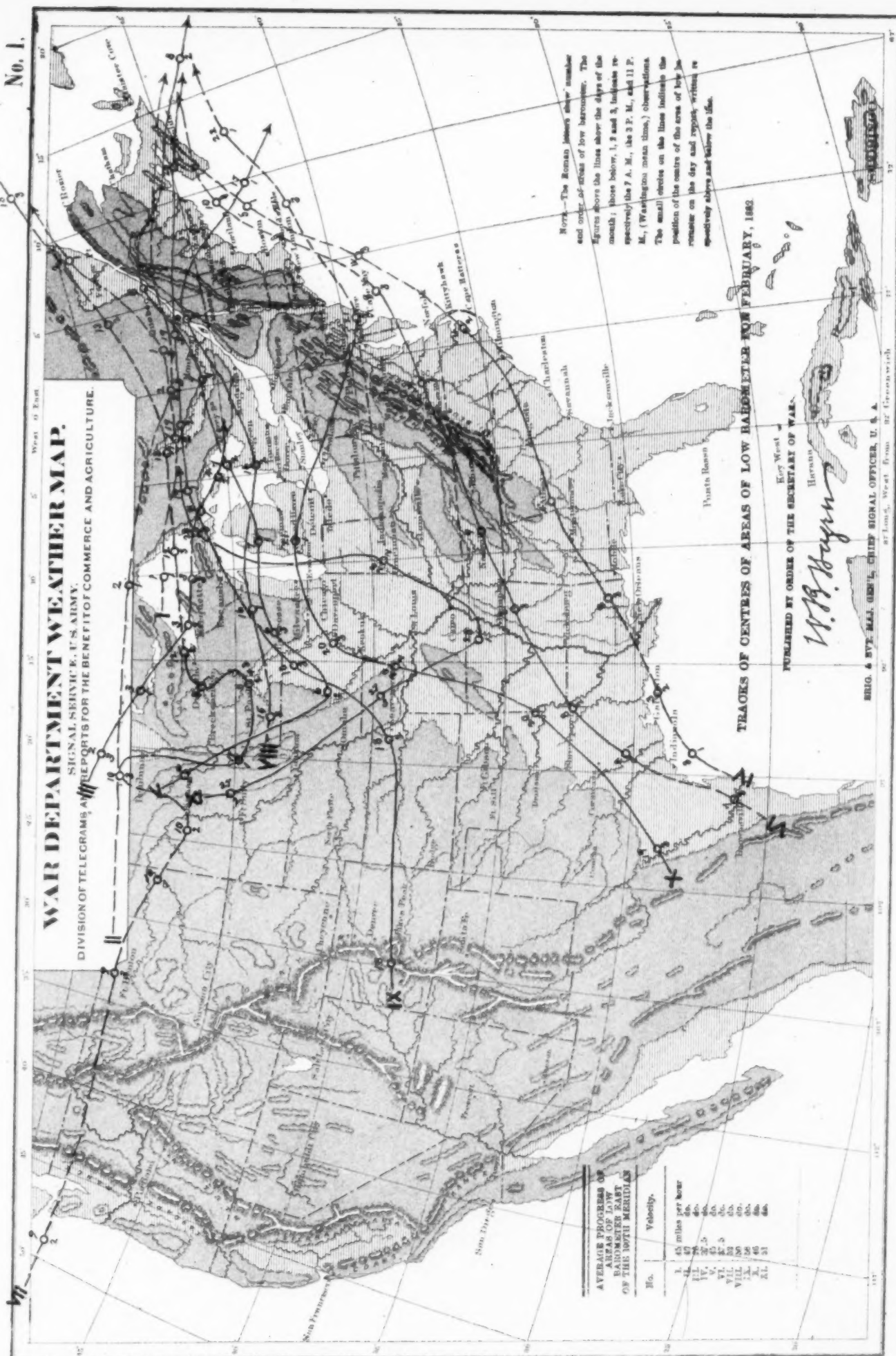
PUBLISHED BY ORDER OF THE SECRETARY OF WAR.

W. H. H. H.

BRIG. & BYE MAJ. GEN'L. CHIEF SIGNAL OFFICER, U. S. A.

AVERAGE PROGRESS OF AREAS OF LOW BAROMETER EAST OF THE NORTH MERIDIAN

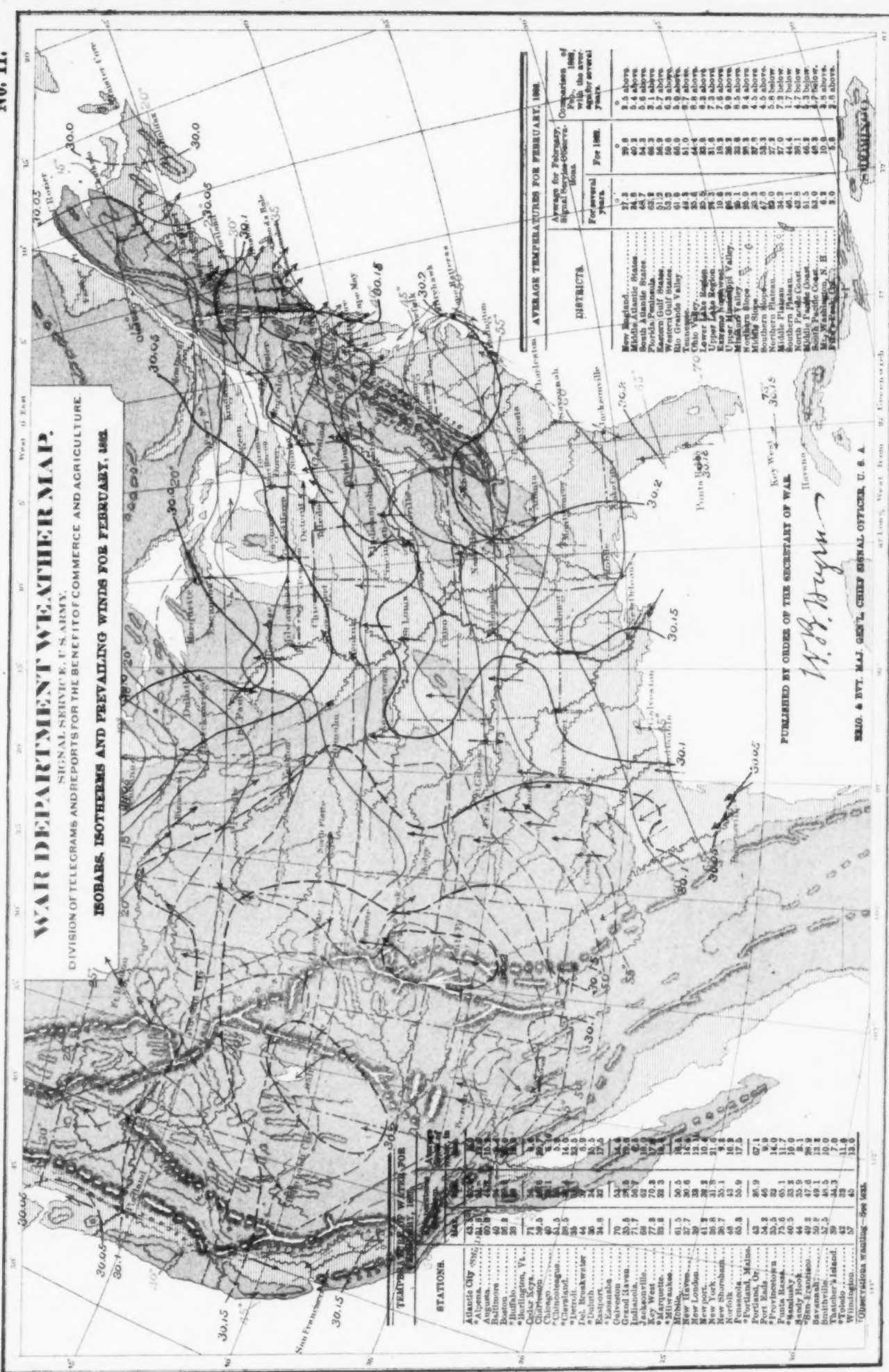
No.	Velocity.
I.	45 miles per hour
II.	40
III.	35
IV.	30
V.	25
VI.	20
VII.	15
VIII.	10
IX.	5
X.	0



WAR DEPARTMENT WEATHER MAP.

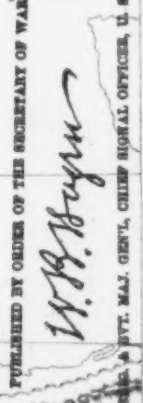
SIGNAL SERVICE, U. S. ARMY,
DIVISION OF TELEGRAMS AND REPORTS FOR THE BENEFIT OF COMMERCE AND AGRICULTURE.

ISOBARS, ISOTHERMS AND PREVAILING WINDS FOR FEBRUARY, 1962

[illegible]

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[illegible]

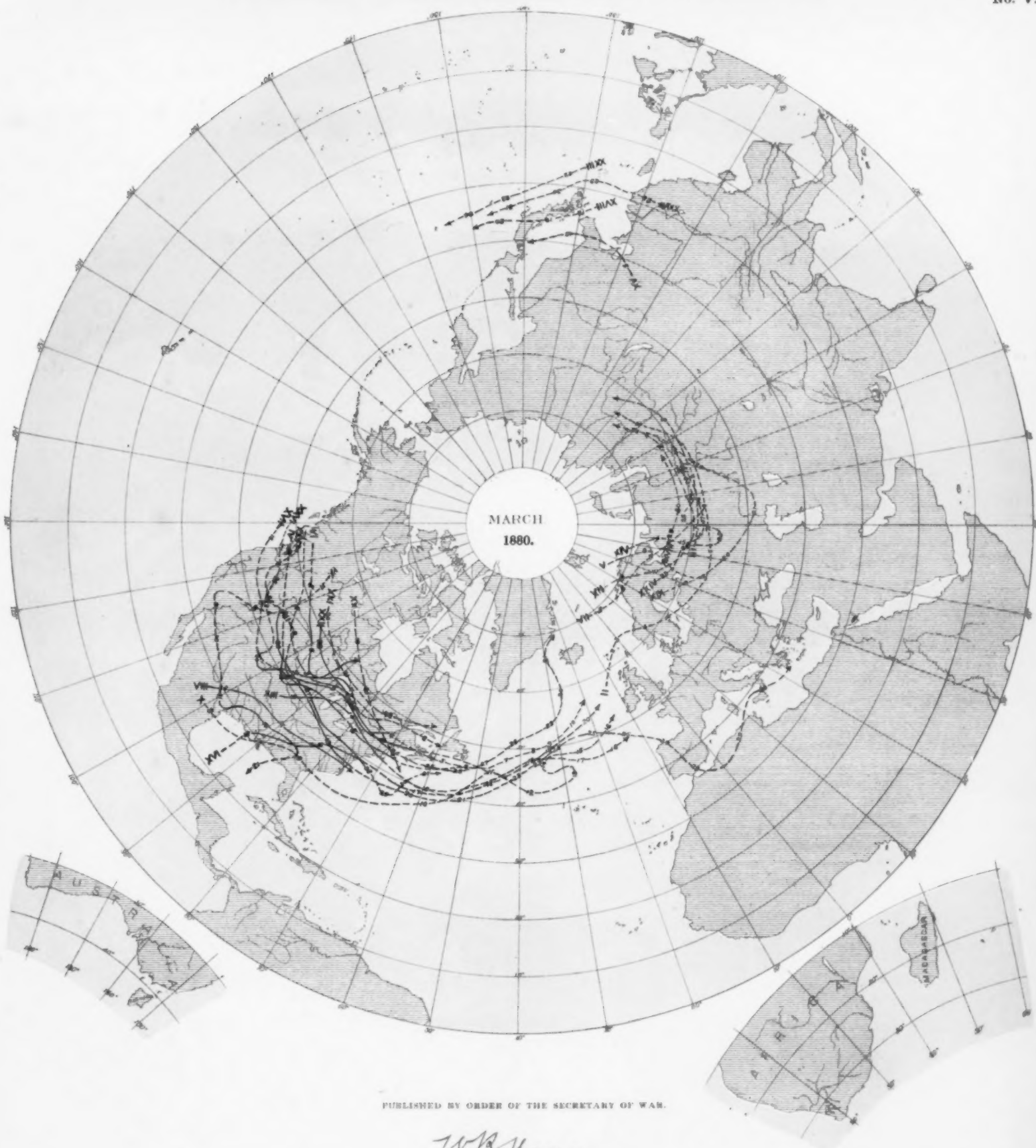


Office of the Chief Signal Officer,

UNITED STATES ARMY.

Charted from Actual Observations taken Simultaneously, Series commencing November, 1877.

No. V.



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W. B. Bayne

BRIG. & BVT. MAJ. GEN'L.
CHIEF SIGNAL OFFICER, U. S. A.

Storm-tracks in *Black*. The Arabic numerals show location of the centres of Low Barometer, at 7:35 A. M., Washington mean time, of that date.

Broken or dotted lines, are doubtful.

INTERNATIONAL CHART.

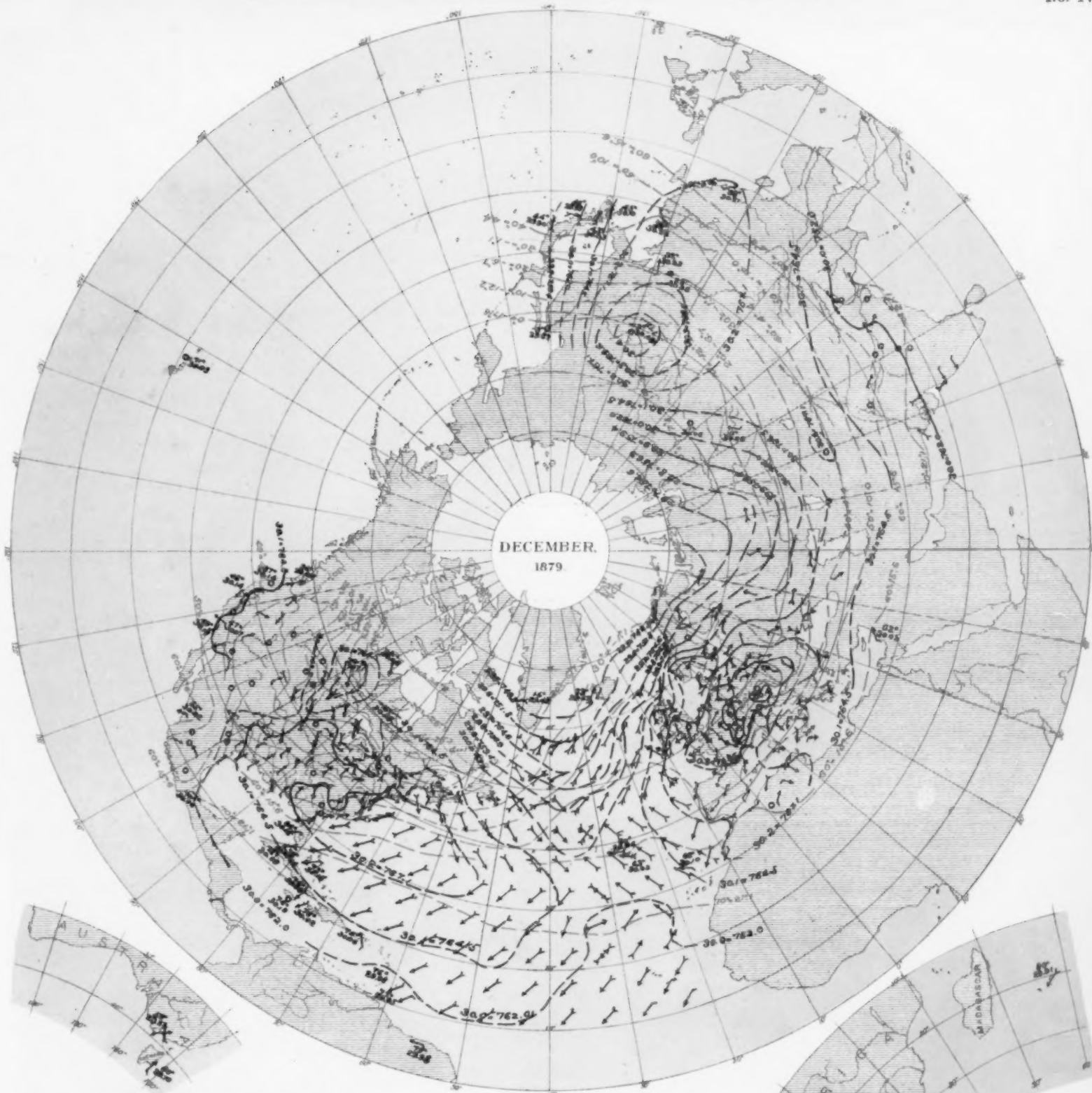
Showing Tracks of Centres of Low Barometer for March, 1880.

THE HELIOTYPE PRINTING CO 211 TREMONT ST BOSTON

Office of the Chief Signal Officer,
UNITED STATES ARMY.

Charted from Actual Observations taken Simultaneously, Series commencing January, 1877.

No. IV.



PREVAILING WINDS.

Arrows show the direction of and fly with, the wind.
Force is shown as follows:

SYMBOLS.	FORCE.	VELOCITY.	
		Miles per hour.	Metres per second.
○	0	0	0
→	1, 2	0 to 9	0 to 4.0
→→	3, 4	9.1 to 22.6	4.1 to 10.1
→→→	5, 6	22.6 to 40.5	10.1 to 18.1
→→→→	7, 8	40.5 to 67.5	18.1 to 30.2
→→→→→	9, 10	67.5 up.	30.2 & over.

PUBLISHED BY ORDER OF THE SECRETARY OF WAR.

W. B. Bryan

BRIG. & BVT. MAJ. GEN'L.
CHIEF SIGNAL OFFICER, U. S. A.

INTERNATIONAL MONTHLY CHART.

Showing mean pressure, mean temperature, mean force and prevailing direction of winds at
7:35 A. M., Washington mean time, for the month of December, 1879, based
on the daily charts of the International Bulletin.

ISOBARS AND ISOTHERMS.

Isobars in black; detached barometer means
in English inches.

Isotherms in red; detached temperature
means in degrees Fahrenheit.

Broken lines, are doubtful.